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ENVIRONMENTAL IMPACT STATEMENT

LITTLE BLACK WATERSHEDS

BUTLER, CARTER, AND RIPLEY COUNTIES, MISSOURI
AND CLAY COUNTY, ARKANSAS



PREPARED BY: UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
COLUMBIA, MISSOURI
JUNE 1975



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Little Black Watersheds
Butler, Carter, and Ripley Counties, Missouri
Clay County, Arkansas

FINAL ENVIRONMENTAL IMPACT STATEMENT
J. Vernon Martin, State Conservationist
Soil Conservation Service

Sponsoring Local Organizations

Soil and Water Conservation District of Butler County
Poplar Bluff, Missouri 63901

Soil and Water Conservation District of Carter County
Van Buren, Missouri 63965

Soil and Water Conservation District of Clay County
Piggott, Arkansas 72454

Soil and Water Conservation District of Ripley County
Doniphan, Missouri 63935

Missouri Department of Natural Resources
Division of Parks and Recreation
1204 Federal Building
Jefferson City, Missouri 65101

Butler County Drainage District 10
Poplar Bluff, Missouri 63901

Naylor Drainage District
Naylor, Missouri 63953

Western Clay Drainage District
Piggott, Arkansas 72454

Butler County Court
Poplar Bluff, Missouri 63901

Little Black Watershed Subdistrict
Naylor, Missouri 63953

Ripley County Court
Doniphan, Missouri 63935.

Clay County Court
Piggott, Arkansas 72454

June 1975

Prepared by:

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
Columbia, Missouri 65201

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LITTLE BLACK WATERSHED, MISSOURI, ARKANSAS

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USDA ENVIRONMENTAL IMPACT STATEMENT

Little Black Watersheds Project

Butler, Carter, and Ripley Counties, Missouri

Clay County, Arkansas

Prepared in Accordance with Sec. 102(2)(C) of P.L. 91-190

SUMMARY

- I. Final
- II. Soil Conservation Service
- III. Administrative
- IV. Description of Purpose and Action

Two interrelated projects for watershed protection, flood prevention, agricultural water management (drainage), and non-agricultural water management (recreation) in Butler, Carter, and Ripley Counties, Missouri, and Clay County, Arkansas, to be implemented under authority of the Watershed Protection and Flood Prevention Act (P.L. 566, 83d Congress, 68 Stat. 666), as amended. (See project map, Appendix B).

- V. Summary of Environmental Impact.

Erosion rates (expressed as tons/acre/year sediment yield) will be reduced to the following levels: sheet erosion (average), 3.1; stream bank, 0.1; and roadside, 0.3. Improved drainage will increase agricultural efficiency. Water quality and aquatic habitat will improve with reduced stream sedimentation.

Floodwater and sedimentation damages will be reduced on 40,254 acres of flood plain land. There will be an average 2-year flood frequency level of protection achieved in the watershed, and with flood protection more intensive use of flood plain lands will occur. Sediment load of the Little Black River will be reduced by 54 percent.

The sediment pools of floodwater retarding reservoirs and the multiple-purpose reservoir will increase warm-water fish habitat, aquatic productivity, and wildlife habitat diversity. There will be 1,311 acres for public water-based recreation, including a 298-acre reservoir and associated recreational facilities. Rural area development will be advanced through increased farm incomes and employment opportunities, higher land values, decreased flood expenses, and a more stable economy. More land-owners in the delta will be able to install needed land treatment practices.

Construction of the 24 floodwater retarding structures and the multiple-purpose reservoir will remove 1,192 acres of forest land, 334 acres of cropland, and 52 acres of pastureland from agricultural and wildlife habitat uses. The Little Black River will have longer duration and less sporadic flows.

Water samples of the watershed indicate that moderately high phosphate concentrations are found in the stream waters.^{4/} Increased production of algal and aquatic plants may occur in impoundments as a response to these higher phosphate levels. Magnitude of this production is not anticipated to cause a nuisance in any of the reservoirs of this watershed.

Proposed channel modification will result in the loss of 205 acres of cropland and 570 acres of forest land and the gain of 718 acres of pastureland. About 2 miles of perennial flow and 37 miles of intermittent flow in these channels will be significantly affected. There will be 11.7 miles of the major ditch No. 3 which will have streambank vegetation removed from both sides.

The clearing of approximately 570 acres of delta forest land will reduce wildlife habitat and recreational hunting opportunities in the lowlands. Traffic, litter, and noise will increase around the B-9 structure recreational development. Of the approximately 106 miles of perennial flowing streams presently in the watershed, 12 miles, as well as 4.5 miles of intermittent stream, will be permanently inundated by reservoir structures.

Fishery habitat will be largely lost on the 1.8 miles of channel enlargement and 1.3 miles of clearing and snagging on the Little Black River.

Three loops of the Little Black River which will be cut off by construction will be preserved. One of them will provide public access to increase opportunities for stream fishing and floating.

VI. List of Alternatives Considered.

- A. Accelerated land treatment only.
- B. Purchase of flowage easements on 21,000 acres of flood plain land.
- C. Purchase in fee title of 21,000 acres of flood plain land.
- D. Zoning and flood plain insurance of agricultural lands.
- E. Dry sediment pools behind the 24 floodwater retarding structures, and accelerated land treatment applied on 65 percent of the watershed area.
- F. A system of 39 floodwater retarding structures, 4.4 miles of levees, six levee closures, 61 miles of channel modification, 29.4 miles of channel clearing and snagging on the Little Black River, and accelerated land treatment applied on 65 percent of the watershed area.
- G. A system of 25 floodwater retarding structures only, and accelerated land treatment applied on 65 percent of the watershed area.
- H. A system of eight floodwater retarding structures, 85 miles of multiple-purpose channel modification, and accelerated land treatment applied on 65 percent of the watershed area.
- I. Extensive channel modification, and accelerated land treatment applied on 65 percent of the watershed area.
- J. A system of 24 floodwater retarding structures, a multiple-purpose reservoir, a floodway in the delta, and accelerated land treatment applied on 65 percent of the watershed area.
- K. A system of 25 floodwater retarding structures, straightening 31 miles of the Little Black River, installing 18 miles of new channel, and accelerated land treatment applied on 65 percent of the watershed area.
- L. A system of 25 floodwater retarding structures, a diversion at Gaines Slough, enlargement of ditch No. 3, alignment of ditch No. 1 to the Little Black River, straightening 17 miles of the Little Black River, and accelerated land treatment applied on 65 percent of the watershed area.
- M. The proposed project with the additional measures to improve fishery. These measures included preserving vegetation along one side of ditch No. 3, digging deep holes below the channel bottom profile and locating obstructions in the channel to erode holes.

N. No action except continuing the present land treatment program.

VII. Written comments were received from the following agencies.

Department of the Army
Department of Health, Education, and Welfare
Department of the Interior
Department of Transportation
Environmental Protection Agency
Advisory Council on Historic Preservation
Governor of Missouri
Ozark Foothills Regional Planning Commission
State of Arkansas
 Department of Planning
 Department of Commerce, Division of Soil and Water Resources
 Department of Health
Arkansas Game and Fish Commission
East Arkansas Planning and Development District
Missouri State Highway Commission
Missouri Department of Conservation
The Wildlife Society, Missouri Chapter

VIII. Draft statement transmitted to CEQ on January 31, 1975.

USDA SOIL CONSERVATION SERVICE
Final Environmental Impact Statement

for

A. Little Black Watersheds, Missouri and Arkansas. a/

Installation of this project constitutes an administrative action. Federal assistance will be provided under authority of P.L. 566, 83d Congress, 68 Stat. 666, as amended.

B. Sponsoring Local Organizations

Little Black Watershed Subdistrict

Butler County Soil and Water Conservation District, Missouri

Ripley County Soil and Water Conservation District, Missouri

Clay County Soil and Water Conservation District, Arkansas

Carter County Soil and Water Conservation District, Missouri

Butler County Drainage District Number 10, Missouri

Naylor Drainage District, Missouri

Western Clay Drainage District, Missouri

Butler County Court, Missouri

Ripley County Court, Missouri

Clay County Court, Arkansas

Missouri Department of Natural Resources, Division of Parks and Recreation

C. Project Purposes

1. Watershed Protection (conservation land treatment): Goals of the project sponsors and the Soil Conservation Service are to obtain 65 percent of the land management and protection measures needed in the watershed over the 12-year project period, and to reduce average annual soil loss in the uplands from 4.3 to 3.1 tons per acre. This will require adequate treatment of an additional 37,500 acres of cropland, 18,000 acres of pasture and hayland, and 66,130 acres of forest land.

Resource management systems are to include all practices that are needed for optimal use of a particular land area. Land treatment

a/ All information and data except as otherwise noted were collected by the Soil Conservation Service and Forest Service, U.S. Department of Agriculture

objectives include shifting marginal or submarginal farmlands to more profitable or socially beneficial uses and improving hydrologic conditions, particularly on forest lands.

2. Flood Prevention: A primary goal of sponsors is to reduce flooding and flood damages in the watershed. Approximately a 2-year level of protection was selected for 40,254 acres of intensively cropped agricultural land as an acceptable level of protection.

An objective of the sponsors is to reduce sediment and scour damage to flood plain soils. Sediment deposition is to be reduced on 15,149 acres of flood plain and delta lands, and scour damages are to be reduced on 6,804 acres.

3. Drainage: Sponsors desire to improve the existing system of flood prevention and drainage ditches in the delta area. The goal is to remove approximately 1 inch of runoff in 24 hours from approximately 59,000 acres of land that have been identified as having an excess water problem. Drainage improvement will allow more efficient production on about 53,000 acres of existing cropland and pastureland. The existing system of multiple-purpose ditches and laterals will also be protected from excessive streambank erosion and channel aggradation or degradation.

4. Recreation: Sponsors intend to increase water-based recreation opportunities in the watershed and provide additional public access to the Little Black River. There will be 1,311 acres developed for public recreation at the multiple-purpose reservoir, including a 298-acre recreation pool. The design capacity (number of people on a Sunday afternoon during the normal heavy use season) will be approximately 1,763 people. In addition, a separate access area on the Little Black River will be developed to accommodate about 80 persons at one time for fishing and picnicking.

Sponsors also desire to minimize fish and wildlife habitat losses as caused by the proposed project and improve these habitats where possible.

D. Planned Project

1. Land Treatment Measures: Application of resource management systems, including appropriate combinations of land treatment measures, is essential to a sound watershed protection and flood prevention program. During the 12-year project period, landowners and operators cooperating with the soil and water conservation districts will develop conservation plans that will achieve proper land use and meet conservation needs on at least 65 percent of the watershed land. Soils will be mapped for the entire watershed. It is estimated

that 2.75 man-years of technical assistance will be needed to complete the soil surveys, which will include about 211,000 acres of the Little Black Watershed.

Resource management systems will be implemented on approximately 37,500 acres of cropland, 18,000 acres of pastureland, and 66,130 acres of forest land.

Cropland in the Little Black River Watershed is almost entirely located in the delta and in the upstream flood plains. The basic conservation practices needed are: conservation cropping systems, crop residue use, land smoothing, irrigation land leveling, and the installation of grassed waterways or outlets, grade stabilization structures, diversions, and drainage field ditches.

Pastureland is located throughout the upland area. The primary practices needed on pastureland include: pastureland and hayland management and planting and ponds for livestock, fish and wildlife, and recreation.

Forest land is used primarily to produce adapted wood crops, to supply watershed protection, and to improve fish and wildlife habitat. Individual management plans will be prepared for approximately 260 forest landowners. The following land treatment measures will be installed: tree planting (240 acres), forest land improvement systems (15,000 acres), and fire control intensification (141,302 acres).

A forestry work plan was developed for private lands in the Little Black Watershed by the Division of Forestry of the Missouri Department of Conservation and the Arkansas Forestry Commission, in cooperation with the U.S. Forest Service. Needs were determined by a field study of the watershed.

Adequate fire protection is necessary if maximum benefits from other watershed works of improvement are to be gained. Additional fire suppression equipment, including a tractor, fire plow, truck, radios, and hand tools will be purchased to meet and provide additional fire control.

During the development of resource conservation plans landowners will be encouraged to plan and apply forage, forestry, and cropland management practices that are important in maintaining or developing favorable wildlife conditions. Forest cutting patterns, differing age classes in forest stands, native grass establishment,

crop residue use, and crop rotation are important considerations that can benefit wildlife.

Some individual farms will be developed for private and income-producing recreation. Recreation practices to be installed include stabilization and improvement of existing facilities and installation of trails and ponds.

The existing program of the U.S. Forest Service for the National Forests, which includes fire control, silvicultural treatments, and other multiple-use resource development, will be continued. The programs for the National Forests of Missouri (Mark Twain and Clark National Forests) provide for a land management inventory of 2,676 acres of national forest land, and installation of silvicultural treatment on 890 acres to improve stand composition and wildlife habitat.

2. Structural Measures: A system of structural measures described below will be installed at locations shown on appendix B.

Construction will include 24 single-purpose floodwater retarding structures and one multiple-purpose structure with associated recreational facilities. One diversion structure will be built on the Little Black River to pass normal flow down the channel and divert floodwater into a floodway. Three water control structures will be installed at three river loop cutoffs, one near the diversion structure and two in Arkansas, in order to maintain desired fishery habitat.

Construction of the floodway will require approximately 1.3 miles of new channel work, downstream of the diversion structure. Multiple-purpose channels for flood prevention and drainage will be developed with channel work along approximately 79.8 miles of previously constructed ditches, and 1.3 miles of new channel (which includes one 0.6 mile segment and one 0.5 mile segment and one 0.2 mile segment for improving alignment of existing manmade ditches). Five drop structures will be installed to reduce the gradient of the main multiple-purpose channel. One drop structure will be installed to reduce the gradient of ditch No. 1. Along the Little Black River in Arkansas there will be about 1.8 miles of channel work to enlarge the cross sectional area and increase capacity, and clearing and snagging on 1.3 miles will increase capacity by improving flow conditions.

Finally, approximately 1.0 mile of levee will be constructed, consisting of 0.2 mile above Harviell, 0.3 mile on the road at the diversion structure, 0.1 mile on Lateral No. 2, and 0.4 mile of short segments at washout areas along the Little Black River.

a. Reservoir Type Structures: The 24 floodwater retarding structures and the multiple-purpose structure will be compacted earth embankments ranging in height from 24 to 82 feet. Principal spillways will be made of reinforced concrete pipes or box culverts with open top risers and will be on yielding foundations. Structures A-3, B-9, C-7, D-2, F-2, and F-11, will have box culvert conduits with energy dissipating outlets; these structures will have two-stage inlets to control runoff and reduce flows from storms of 5-year frequency magnitude or smaller. Features of a typical earth dam with pipe drop inlet are shown in Figure 1. Four structures (A-3, B-9, C-7, and D-2) will have an ungated port and a gated port near the same elevation (Figure 2). These gated ports will be operated when necessary to reduce the peak discharge of the channel design storm at the diversion structure and floodway.

The foundations and abutments at all structure sites are gravelly and range from clayey silts to silty clays. The generally dense residuum in the foundations ranges from 5 to about 60 feet in depth. All structures are planned with foundation drains to control seepage in the moderately permeable foundation soils.

A positive cutoff through the permeable foundation materials to bedrock is planned for multiple-purpose structure B-9. This cutoff will extend up the slopes to the permanent pool elevation.

The 24 floodwater retarding structures will have vegetated emergency spillways to release runoff when reservoir storage capacities and normal release rates have been exceeded. It has been estimated that the emergency spillway for sites A-2, A-3, A-7, B-1, B-2, B-3, B-4, C-7, and D-2 will operate less than one time in 100 years (less than 1 percent chance). At sites F-2, F-3, F-11, and G-2 it is estimated that the spillways will operate two times in 100 years (2 percent chance), and at sites A-5, A-13, D-1, D-3, D-4, D-5, D-7, D-8, D-9, D-12, and E-6 the spillways are expected to operate four times in 100 years (4 percent chance).

Multiple-purpose structure B-9 will have a rock emergency spillway which is expected to operate less than one time in 100 years (less than 1 percent chance).

The 24 floodwater retarding structures will have a total floodwater detention capacity of 52,861 acre-feet. The retarding pools will contain from 2.25 to 11.08 inches of runoff from the contributing areas. Sediment pools will have an initial detention capacity of 8,577 acre-feet. These structures will control a drainage area of 176.43 square miles which is 52 percent of the total watershed area. Some dams on smaller tributaries or in headwater locations may not retain water in the sediment pools.

The multiple-purpose structure will control an additional 25.57 square miles. Total floodwater retention capacity will be 11,586 acre-feet for this structure, which includes 4,293 acre-feet between the low and high stage flood inlets. The retarding pool will contain 8.50 inches of runoff from the contributing area. The Little Black River has been classified as "A" water, indicating that it is suitable for whole body water (primary) contact recreation. It is expected that the multiple-purpose reservoir waters will have similar quality.

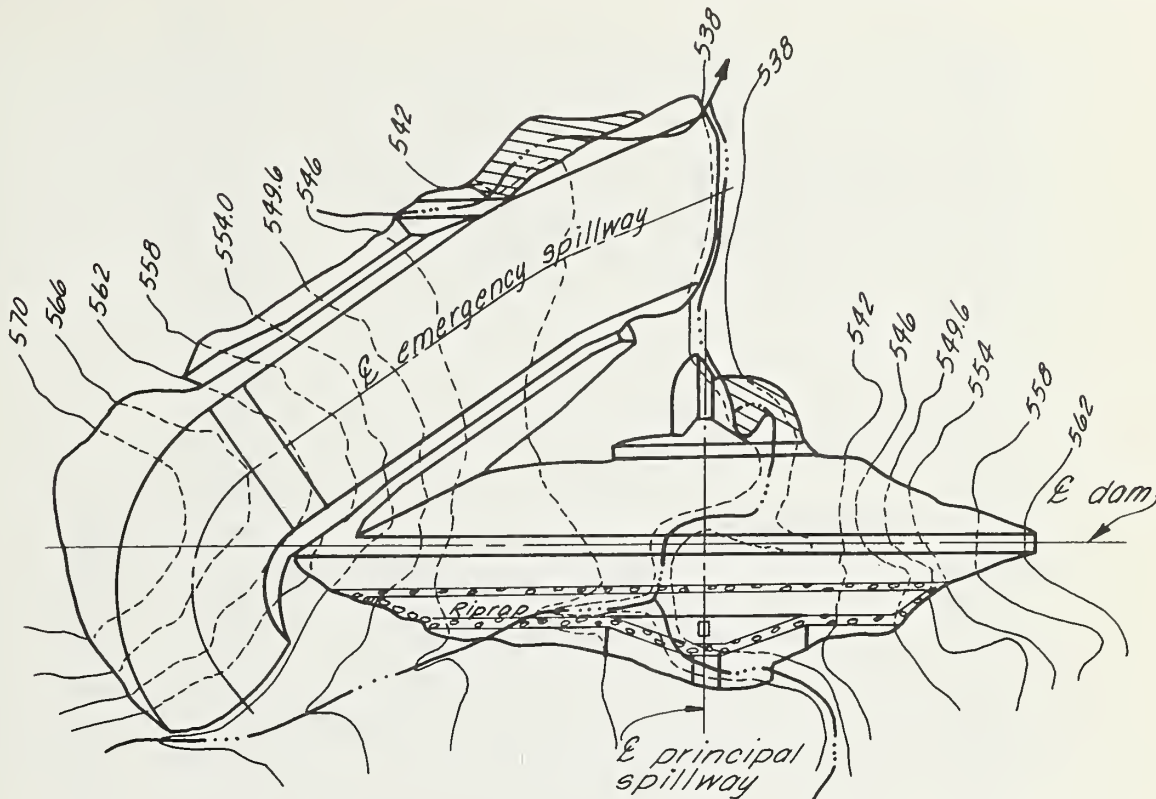
All structures were designed for at least 100-year life. The principal spillway crests will be set at the elevation of the 100-year accumulation of sediment unless sponsors request the risers to be ported at a lower elevation.

Borrow areas will be located within the reservoir area except for that portion of usable material which is excavated from the emergency spillway. The excavation from the emergency spillways and abutments will generally be clays from the residuum. The borrow from the alluvium will be sandy silts, sands, and gravels.

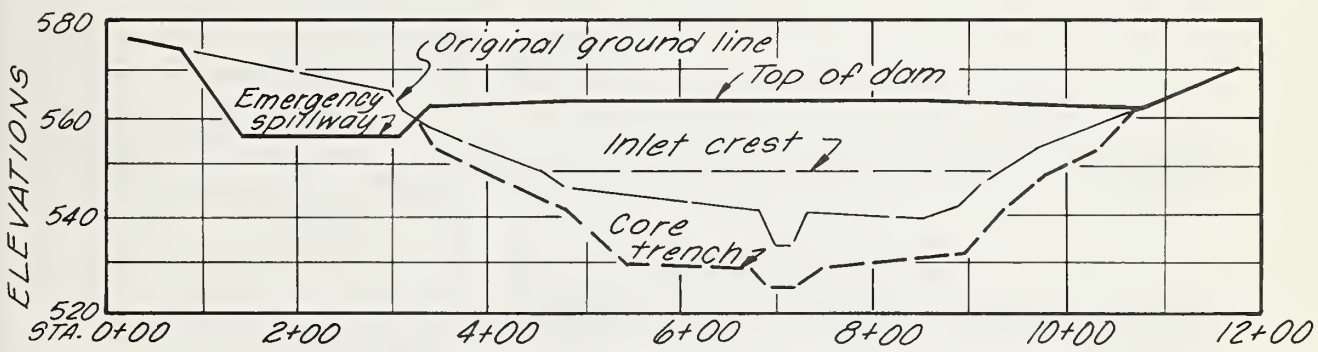
All structures were designed with facilities to permit draining of the sites and borrow areas during construction and lowering the sediment and recreation pools for maintenance and repair.

Clearing on all sites will be limited to the main areas of the sediment pools or recreation pool and those areas required for construction of the earth fills and emergency spillways. Narrow reservoir areas within the channel banks will not be cleared. The areas required for earth fills and emergency spillways constitute approximately 210 acres; present land use on these areas is 8 percent cropland, 85 percent forest land, 6 percent pastureland, and

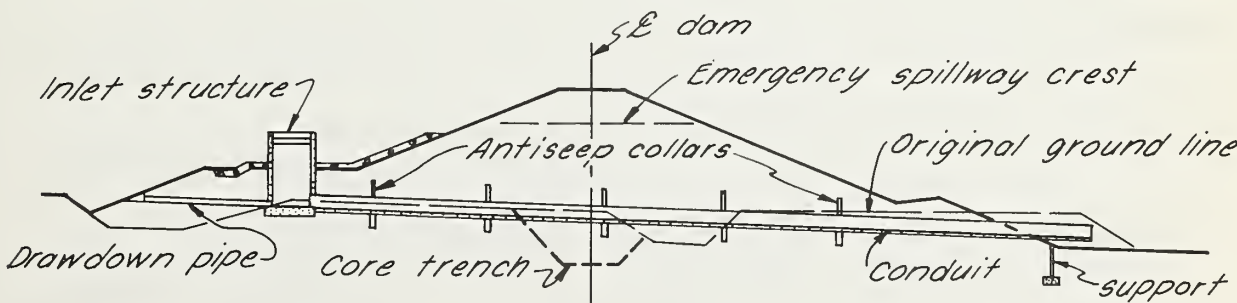
TYPICAL EARTH DAM WITH PIPE DROP INLET



PLAN OF EMBANKMENT AND SPILLWAY

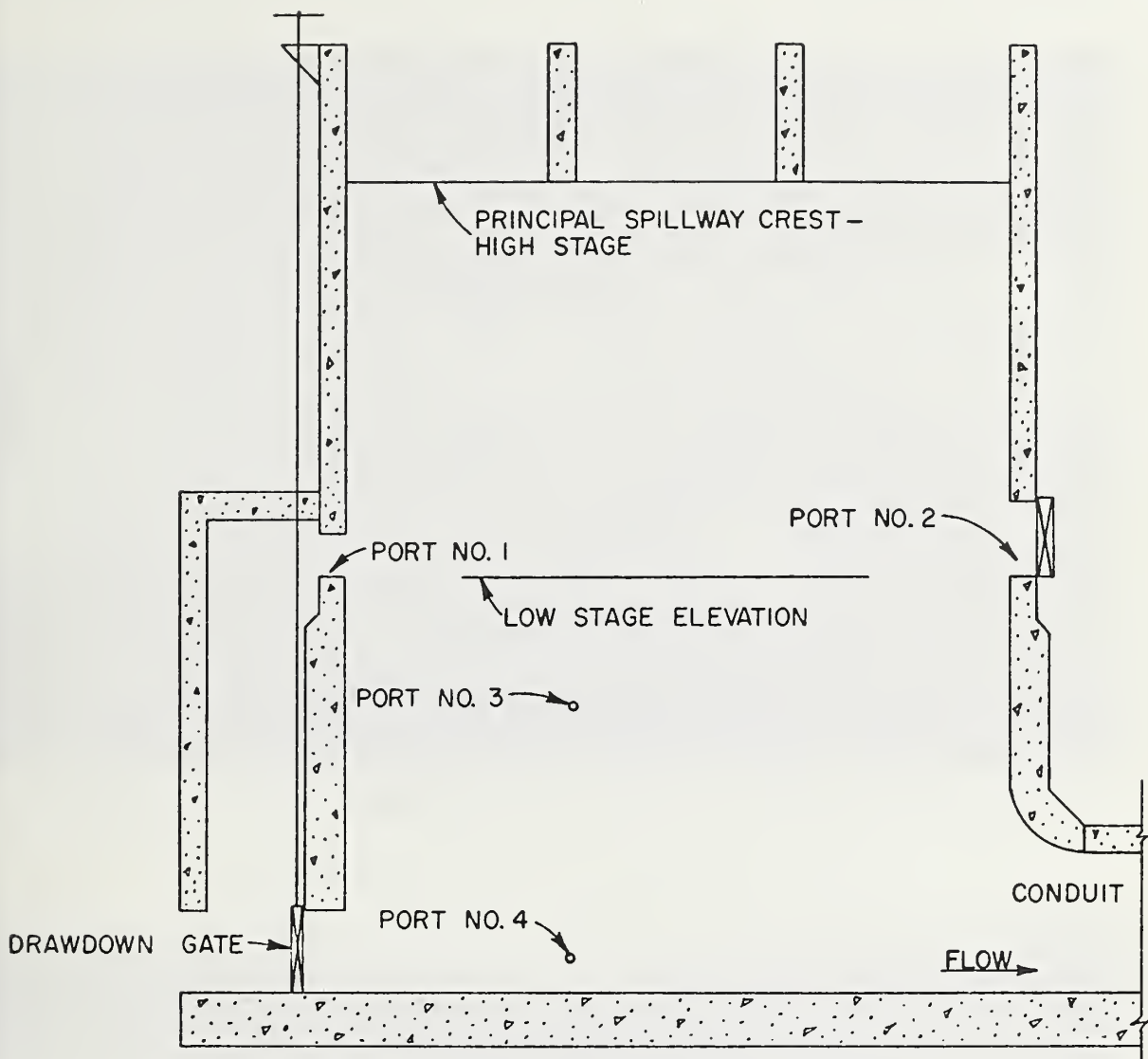


PROFILE ON CENTERLINE OF DAM



CROSS SECTION OF DAM ON CENTERLINE OF PRINCIPAL SPILLWAY





TYPICAL SECTION OF RISER
SHOWING PORTS REQUIRED IN STRUCTURES A-3, B-9, C-7, & D-2

Port No. 1 is open at all times and is capable of carrying approximately 5 CSM at peak outflow.

Port No. 2 is controlled by a cast iron sluice gate which can be raised or lowered from the top of the dam.

Ports 3 and 4 are water release ports open at all times to release water from the structure to insure more normal summer stream flows during periods of drought.



A CONSTRUCTED FLOODWATER RETARDING STRUCTURE IN ARKANSAS IN TOPOGRAPHY SIMILAR TO LITTLE BLACK WATERSHED.



CONSTRUCTION SCENE DURING CONSTRUCTION OF FLOODWATER RETARDING STRUCTURE. NOTE INLET RISER ON UPSTREAM SIDE.



Photo credit: Daily American Republic
Poplar Bluff Printing Co. Inc., Poplar Bluff, Mo

HARVIELL DITCH - BUTLER COUNTY.

THIS PHOTO REPRESENTS THE CONDITION OF APPROXIMATELY 50 MILES OF EXISTING MANMADE DRAINAGE DITCHES WHERE DRAINAGE FLOW IS NEGLIGIBLE AND FLOODWATERS ARE RETARDED. THESE DITCHES CARRY WATER ONLY DURING PERIODS OF SURFACE RUNOFF. CONSTRUCTION IS PLANNED FROM ONE SIDE AND THE WILDLIFE HABITAT ON THE OPPOSITE SIDE WILL NOT BE DISTURBED.



RECONSTRUCTION OF DITCH SIMILAR TO ABOVE CONDITIONS. NOTE WORK FROM ONE SIDE -- SPOIL DUMP IS BACK FROM DITCH TO ALLOW ACCESS ROAD FOR MAINTENANCE.

1 percent other uses. The area required for the sediment pools in the floodwater retarding structures and the recreation pool in the multiple-purpose structure is approximately 1,368 acres. Present land use on these areas is 23 percent cropland, 3 percent pastureland, and 74 percent forest land.

A total of 3,880 acres is to be acquired by perpetual easements for the 24 floodwater retarding structures. This area includes 1,070 acres for sediment pools, 196 acres for earth fills and emergency spillways, and 2,614 acres for floodwater detention pools.

The total area to be acquired for the multiple-purpose structure is 1,465 acres. This includes 298 acres for the permanent pool (157 acres for the sediment pool, and 141 acres for the recreation pool), 334 acres for the temporary flood pool, 14 acres for the dam and emergency spillway, and an additional 819 acres for recreational development. All land will be acquired by fee simple title except 154 acres on which flowage easements will be obtained. (See Table 4, page 110, for further information on land use changes.)

Existing facilities affected by structures are roads, bridges, powerlines, buildings, a pipeline, and 3 cemeteries. An easement for temporary flooding or rerouting of county roads in the flood pools of structures A-3, B-9, B-1, F-2, F-3, and F-11 will be acquired.

State Highway 21 will be moved or modified because of flooding from structure C-7, and an easement will be obtained from the Missouri State Highway Department for this purpose. In addition, State Highway 142 will require modification above structure F-3 because of temporary floodwater on the right-of-way. Powerlines will be modified, moved, or removed at sites A-2, A-3, and F-2. Easements will be obtained for an oil pipeline in the flood pool of B-9 and a powerline in the flood pool of F-2. The oil line crosses the permanent pool where it is contained within stream banks in the upper part of the reservoir area. Only short lengths of line will be permanently inundated but additional lengths will be subject to temporary inundation by floodwaters. It is anticipated that protective measures such as double casing or valves will be needed to reduce damage due to accidental spills. The removal of two hunting cabins in the flood pool of F-2 and a residence in the F-11 flood pool will be necessary. The residence at site F-11 will involve displacement of four occupants. Two vacant houses at site A-3 will be removed, and at site C-7, one residence involving 6 occupants needs to be relocated. At B-9, one tenant farming operation involving 4 occupants will be relocated. Old family cemetery plots are located in the flood pools of sites A-7, B-9, and C-7. The plot in site C-7 contains approximately 25 graves with the latest date being 1893. A levee around or mound is planned to prevent flooding of this plot. The elevation of the lowest grave is 478.4 feet above mean sea level, and the crest of the spillway is an elevation of 497.1 feet. The levee or mound is to be built to

an elevation of 497.9 feet or 19.5 feet above the lowest grave. The plot in Site B-9 contains approximately 25 graves with the latest known burial date in 1896. The lowest elevation in this cemetery is 440.3 feet above mean sea level. The elevation of the recreation pool is 440.0 feet. This cemetery will be moved to an elevation above the temporary flood pool. The plot in site A-7 contains approximately 20 graves with the latest burial in approximately 1918. The lowest elevation in this cemetery is 539.8 feet. Crest of the emergency spillway is 548.5 feet. A levee or mound is to be built to an elevation of 549.0 feet or 9.2 feet above the lowest grave. If a levee is constructed, a drain pipe with a flap gate will be installed to outlet internal water.

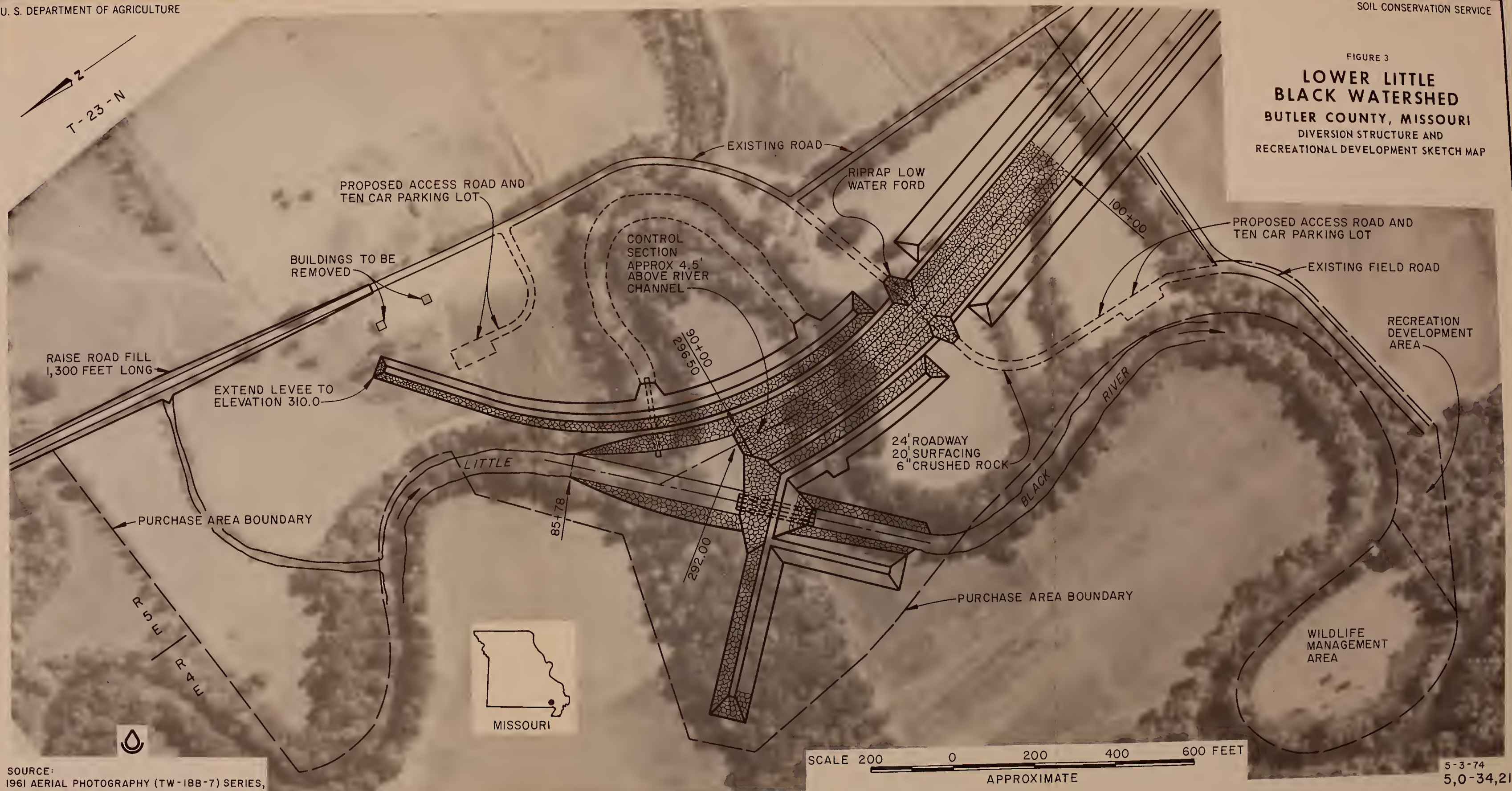
Sediment pools in all the single-purpose floodwater retarding structures will have potential for limited recreational use by the owners, operators, and their friends by permission. Access by the general public will be prohibited unless or until adequate sanitary facilities are provided which meet state and local health requirements. At site A-3 the present landowners have indicated their intent to provide general public access on a fee basis to the sediment pool under their control. The Department of Conservation as a landowner at the C-7 site has indicated the intent to permit free public access.

b. Diversion Structure, Floodway Channel and Multiple-Purpose Ditches: An earth fill diversion structure will be installed on the Little Black River in SE 1/4, Sec. 24, T23N, R4E. This structure will have four 48-inch reinforced concrete conduits which will maintain normal bankfull flow in the Little Black River downstream from the structure, and a control section with a bottom elevation approximately 4.5 feet above the river channel bottom which will divert flood flows into a floodway. The diversion structure, the river channel at the structure entrance, the control section, and the wing levees will all be protected from erosion with riprap. General design of the diversion structure is shown in Figure 3.

The floodway channel will be approximately 1.3 miles long and constructed in low plasticity clayey silts. The bottom will be about 60 feet wide, with side slopes of 2:1. There will be 16-foot wide berms along both sides of the channel, which will be shaped and leveled to a height of 10 feet above natural ground level. Berms will be used as access roads for channel maintenance equipment. Next to the berms will be spoil banks with 3:1 inside slopes approximately 30 feet wide and outside slopes 6:1 or flatter. Inside slopes will be planted to grass and woody vegetation adapted for wildlife. The Missouri Department of Conservation will be consulted for selection of the most suitable plant species for revegetation of these slopes. Figure 4 shows a typical channel cross section.

Materials to be used in construction of the floodway channel are stable for planned water velocities. Therefore, no cutting or scour is anticipated. The lower part of the floodway channel will have continuous spoil banks on each side from the straight drop structure

FIGURE 3
**LOWER LITTLE
 BLACK WATERSHED**
BUTLER COUNTY, MISSOURI
 DIVERSION STRUCTURE AND
 RECREATIONAL DEVELOPMENT SKETCH MAP



SOURCE:
 1961 AERIAL PHOTOGRAPHY (TW-188-7) SERIES,
 AND INFORMATION FROM FIELD TECHNICIANS

at the lower end of the floodway, upstream to the point at which the hydraulic grade line and the natural ground level coincide. At this point the spoil banks will have an opening which will act as an emergency spillway when flood flows exceed a 2-year frequency. Below the emergency spillway the hydraulic grade line is above ground level, and the spoil banks will carry ditch flows above ground level to the straight drop structure.

A straight drop structure (similar to the one shown in Figure 5) will be constructed on the county road at the lower end of the floodway (SW 1/4, Sec. 30, T23N, R5E), and will allow water passing through it to flow downstream at a nonerosive rate. Unlike Figure 5, this structure will allow a 6.1 feet water drop through a weir 20 feet wide and 11.2 feet deep, and there will be no water storage above this structure. A bridge for the county road will be constructed over the structure.

Land rights for the floodway will be obtained by easement. The area outside the crown of the spoil bank will be shaped to a flat slope to be used by landowners for agricultural uses after construction is completed. When cleanout is required, this area will be used to waste spoil material. The area inside the top of the spoil bank will be restricted from grazing by fencing where needed to control livestock. The total area required for construction of the floodway and the drop structure is approximately 46 acres. Approximately 13 acres will be outside the spoil bank crown. Present land use of the floodway channel area is 42 percent cropland and 58 percent forest land.

The floodway will require the removal of one dwelling near the drop structure, and one set of farm buildings including a dwelling near the diversion structure. This portion of the project will displace two families, comprised of 10 persons.

One loop of the Little Black River, approximately 0.2 mile long, located in Sec. 24, T23N, R4E, will be cut off by construction of the floodway. This loop will be blocked at both ends and an inlet pipe installed to maintain the existing water level. In addition, an area east of the diversion structure which contains large beech trees will be preserved.

Multiple-Purpose Flood Prevention Drainage Ditches: Approximately 80 miles of multiple-purpose flood prevention drainage ditches will be rebuilt and modified. Presently, there are 2 miles of perennial flow, 37 miles of intermittent flow, and 41 miles of ephemeral flow associated with these ditches. Ditches No. 1, 2 and 3 are nearly parallel to the Little Black River. The other major ditches--Brown-Taft, Neelyville, Harviell, and Indian Creek--are laterals which drain the northern and eastern areas of the delta into ditch No. 3. There are also several minor ditches which are collector laterals for the major ditches; these include the W.P.A., Epps, and Sappington ditches which are all laterals to Harviell Ditch; Suder, a lateral to Neelyville Ditch; and Birdslash, a lateral to ditch No. 2.

Construction on the 80 miles of multiple-purpose ditches will be along the existing ditch alignments with the exception of approximately 1/2 mile in ditch No. 3 near the Missouri-Arkansas state line. Here, the proposed alignment follows an old ditch which has been filled and lies between the existing ditch No. 3 and Indian Creek Ditch.

Ditch No. 3 begins at the end of the floodway channel and will carry the 2-year frequency flood flow diverted from the Little Black River and a 2-year frequency flood flow from the contributing delta area. This capacity will provide an outlet for all other multiple-purpose ditches in the delta which are designed to remove approximately 1 inch of runoff in 24 hours. The bottom widths of ditch No. 3 will range from 60 feet at the upper end to 117 feet near its confluence with the Little Black River. Channel design and construction will be similar to those described for the floodway channel, see Figure 4.

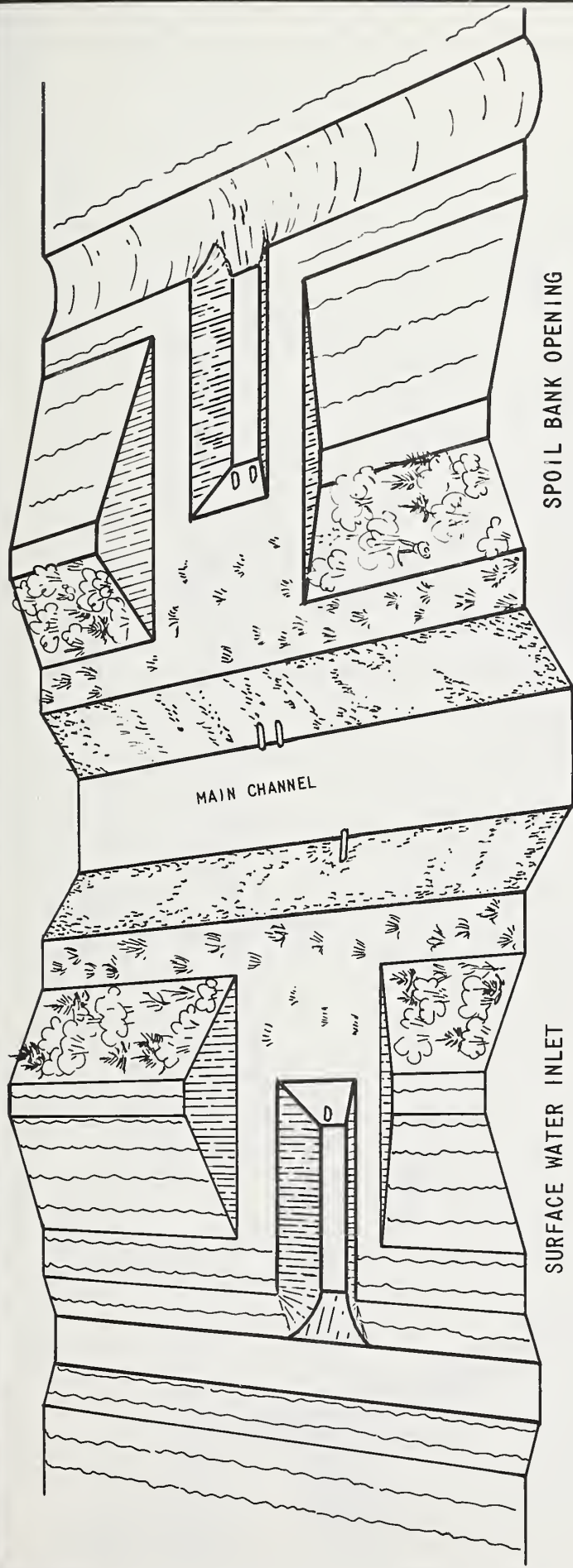
Construction of four spoil bank openings per mile on each side not less than 100 feet wide, will permit overflow of floodwaters in excess of the designed ditch capacity. Corrugated metal pipe inlet structures will be installed to allow local field and road drainage into channels. There will be approximately eight inlets per mile with an average of four on each side of the channels. They will act as grade control outlets from field and road drainage systems. Drainage collection basins approximately 2 feet deep will be constructed at each inlet.

Ditch No. 3 will generally be 2 to 3 feet deeper than at present, and, at points as much as 7 feet deeper. Most of the ditch bottom will be located at approximately the contact zone between silty or clayey materials and the underlying sandy deposits as a result of the deepening.

Four drop structures will be constructed along ditch No. 3 for grade stabilization. All structures will permanently retain water 4 feet deep immediately upstream; these impoundments will have a total surface area of 175 acres. The drop structures will have weir notches designed to maintain channel capacity at designed depth of flow. Each weir will have a port opening approximately 1 foot square near the bottom which will permit water flow and fish passage from one pool to the other. The location of drop structures and description of weir notches is presented below:

DROP STRUCTURES ALONG DITCH NO. 3

<u>Structure No.</u>	<u>Location</u>	<u>Weir Notch</u>
3	(Sec. 1, T22N, R4E)	66 feet wide x 7.2 feet deep
4	(Sec. 23, T22N, R4E)	66 feet wide x 7.4 feet deep
5	(Sec. 32, T22N, R4E)	90 feet wide x 7.4 feet deep
6	(Sec. 11, T21N, R3E)	90 feet wide x 7.6 feet deep



WOODY SPECIES APPROXIMATELY 30' WIDE FOR WILDLIFE HABITAT

FARMING AREA

FARMING AREA

1 OR FLATTER

6

SPOIL

3

1

BERM

DEPTH

GRASSES

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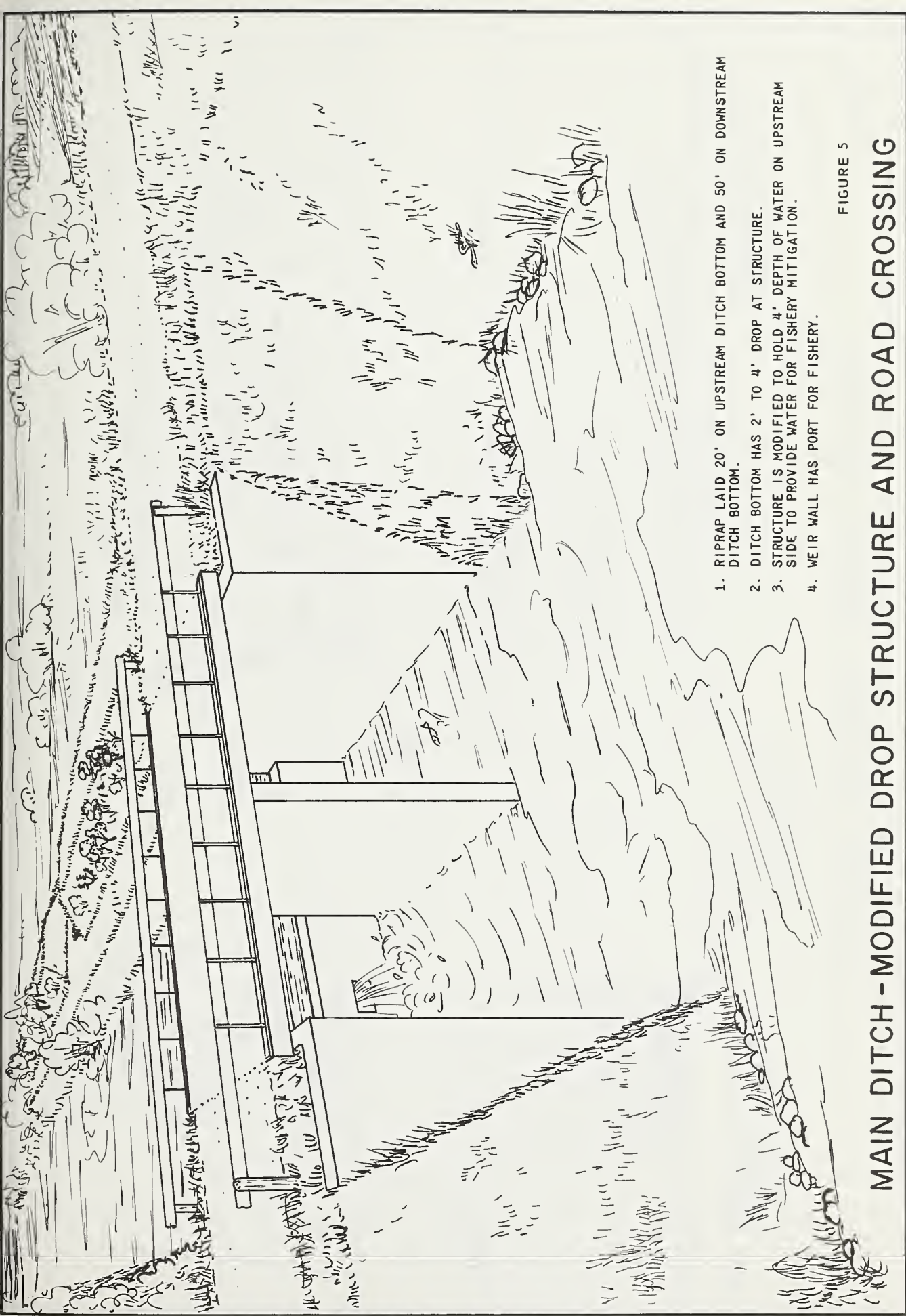
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SPOIL

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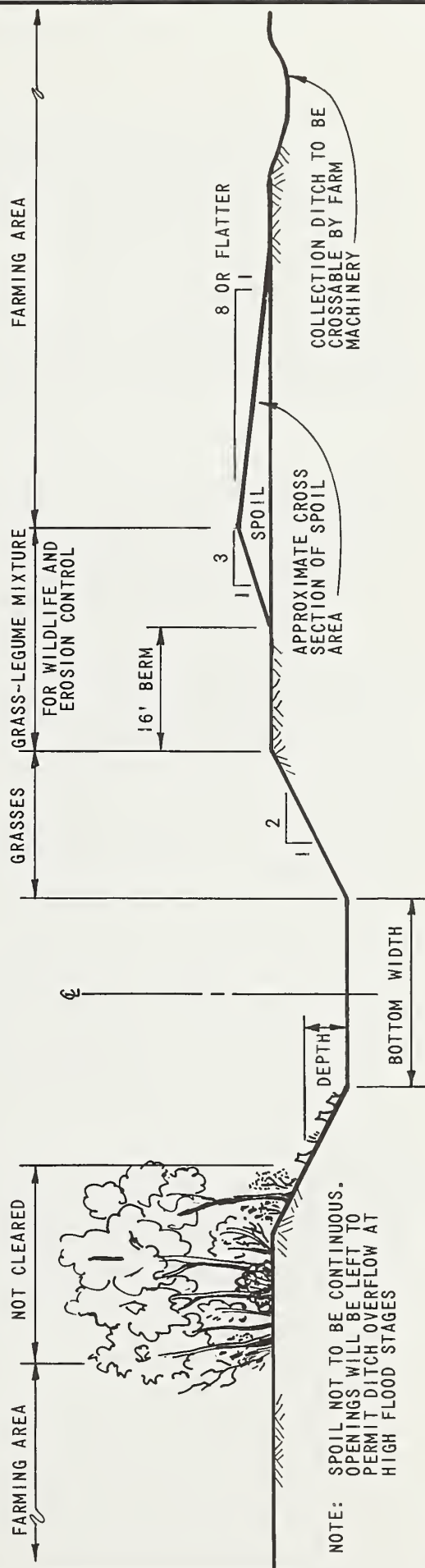
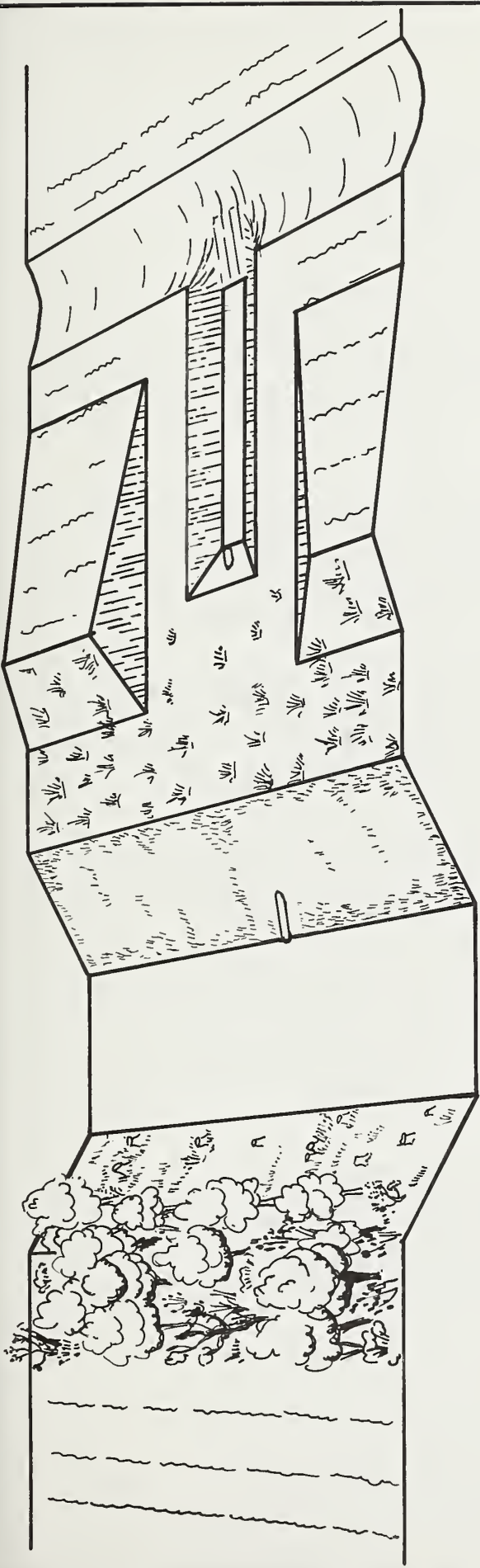




1. RIPRAP LAID 20' ON UPSTREAM DITCH BOTTOM AND 50' ON DOWNSTREAM DITCH BOTTOM.
2. DITCH BOTTOM HAS 2' TO 4' DROP AT STRUCTURE.
3. STRUCTURE IS MODIFIED TO HOLD 4' DEPTH OF WATER ON UPSTREAM SIDE TO PROVIDE WATER FOR FISHERY MITIGATION.
4. WEIR WALL HAS PORT FOR FISHERY.

FIGURE 5

MAIN DITCH - MODIFIED DROP STRUCTURE AND ROAD CROSSING



TYPICAL CHANNEL CROSS SECTION

SHOWING CONSTRUCTION WORK FROM ONE SIDE TO SAVE EXISTING WILDLIFE HABITAT ON OPPOSITE SIDE.

FIGURE 6

Water levels will be maintained behind the weirs by runoff and natural overflow from the Little Black River via Gaines Slough. Overflow from this slough currently flows into ditch No. 3 through a small lateral. A pipe will be installed with a maximum capacity of 25 c.f.s. to carry overflow from the slough to ditch No. 3.

Construction of the outlet for ditch No. 3 into the Little Black River will cut off two meanders of the river channel, one approximately 0.4 mile long and the other 0.3 mile long in Sec. 14, T21N, R3E, Arkansas. These meanders will be blocked and pipe culverts will be installed to provide outlets for excess water. This area will include approximately 23 acres and will be acquired.

All other channels will be rebuilt and increased in depth to provide greater capacity and more drainage outlets. Construction activities will be confined to one bank, leaving vegetation on the opposite bank undisturbed and available for wildlife habitat (see Figure 6). These ditches will be constructed in silty clay soils and will be designed to remove approximately 1 inch of runoff in 24 hours.

The hydraulic grade line will be based on the capacity of downstream channels and, under normal conditions, insignificant backwater effects should result. Storms exceeding the 2-year frequency on the Current River produce significant backwater effects, and flooding will occur on several thousand acres of common flood plain.

Water velocities in the ditches are based upon a stability analysis of the most erosive ditch material. Lateral ditches will have nonerosive outlets where they enter ditches because of the grade-stabilizing effect of the four drop structures.

The total area required for construction of all ditches is approximately 1,666 acres. The present land use of this area is 33 percent cropland, 52 percent forest land, and 15 percent ditch channels. Part of this area (351 acres) will be on the field side of the crown of the spoil bank on ditch No. 3. This area will be available for agricultural uses. (See Table 4 for further information on land use changes.)

The existing Little Black River channel will be enlarged approximately 1.8 miles from its confluence with ditch No. 3 to approximately 1 mile below the county highway bridge at Success, Arkansas. Approximately 0.6 mile will be new alignment and the remaining 1.2 miles will be along its present alignment. It will be able to carry 2-year frequency flood flows from the Little Black River above its confluence

with ditch No. 3 and the designed flows from ditch No. 3. The channel bottom widths will range from 97 to 116 feet. Riprap will be installed to control erosion at the confluence of the Little Black River and ditch No. 3 and downstream from the confluence on the outside curves of the river.

About 1.3 miles of the Little Black River will be cleared and snagged. This work will be performed on a reach which is about 3 miles above the confluence of the Little Black and the Current Rivers. Channel clearing and snagging will remove fallen trees, gravel bars, and other channel obstructions.

c. Levees: Installation of approximately 1.0 mile of levee is planned. One levee will be immediately upstream from the diversion structure and will prevent flood flows from inundating lowlands to the east. It will be constructed by raising approximately 0.3 mile of existing road to an elevation slightly higher than the west bank of the Little Black River. A corrugated metal culvert, approximately 18 inches in diameter with a flap gate, will be installed through the levee to drain low areas to the east. Borrow will be obtained from adjacent agricultural or forested areas.

North of Harviell approximately 0.2 mile of levee will be constructed adjacent to Cane Creek. This levee will prevent flooding of Harviell and will keep flood flows on Cane Creek out of the watershed area. It will be an earth fill structure about 8 feet high between the railroad fill and the foothills north of Harviell. Borrow will be obtained from adjacent agricultural or forested areas.

Three washout areas along the main channel (Sections 25, 35, and 36, T23N, R4E, Missouri) will be protected by about 0.4 mile of levee. These are areas where the river has scoured a channel and washed across croplands. The tops of the earth fill levees will be approximately 2 feet above the natural river bank. One of these levees (at Gaines Slough in the NW Sec. 36, T23N, R4E) will have a pipe with approximately 25 c.f.s. capacity installed to maintain flow in the Gaines Slough scour channel. Borrow will be obtained from adjacent agricultural or forested areas.

A levee approximately 0.1 mile long with a 100 c.f.s. capacity pipe will be constructed at the break in the river bank in Sec. 24, T22N, R3E. It will be a low earth fill structure to prevent the overflow of the Little Black River through a scour channel connected with ditch No. 2. The fill height will be slightly higher than the existing river bank. When flood flows occur in the main channel, excess water will flow around this structure. Borrow will be obtained from adjacent agricultural or forested areas.

d. Archeological Considerations: Eighty historic and prehistoric sites have been located within areas subject to impact by project installation. Five of these sites are particularly important, (23BU97, 23RI102, 23RI164, 23BU10, 3CY34) and project measures were relocated or project plans were modified to avoid impacts to them. Three sites are cemeteries. The plan for preservation or moving of these properties is described on pages 13 and 16. Of the remaining sites, nine are located in areas which will be disturbed by construction for dams and spillways. Thirty are within sediment pools. Ten will be covered by spoil from the ditch modification and 17 are in the area of planned ditch enlargement. Six sites are within the area to be acquired for the recreation development at structure B-9. All sites have been reviewed by the State Historic Preservation Officers and the Soil Conservation Service and there are no other reasonable or prudent project alternatives that will avoid damage. The Secretary of Interior and the Advisory Council have been furnished information regarding the sites located and opinions have been requested regarding the need for recovery, protection, or preservation of these properties. The necessary work required to preserve, protect, or recover selected archeological and historical resources will be performed in accordance with the archeological and historic preservation act (PL-93-291) prior to construction of the measure affecting the site.

Consultation and coordination have been used to insure that the provisions of section 106 of PL-89-665 and PL-86-523 as amended by PL-93-291 have been met; however, Executive Order 11593 does not change any agency responsibility for historic preservation. The National Park Service will be advised of current construction schedules.

Close coordination and cooperation between the Soil Conservation Service and agencies and groups with archeological concerns have expedited the planning effort to date, and have allowed project modifications for the preservation of significant sites. Prior to construction, detailed plans and specifications will be developed. The State Historic Preservation Officers will be consulted about specific impacts of particular project measures. With his assistance, plans will be developed to further minimize impacts where possible, by shifting the location of project features and the designation of areas which need to be protected. During construction, this same coordination and cooperation will be necessary to insure that new discoveries can be given adequate treatment. If sites are discovered during construction, the Missouri Archeological Survey, the State Historic Preservation Officer, and the National Park Service will be immediately notified.

e. Summary of Land Rights: Access to land for the installation of structural measures will be obtained by perpetual easement or fee simple title, as described below:

1. By perpetual easements, 3,880 acres for the 24 floodwater retarding structures.

2. By perpetual easement, 154 acres for the B-9 multiple-purpose structure.
3. By fee simple title, 1,311 acres for recreation facilities and flood easements at structure B-9.
4. By perpetual easement, land for the floodway.
5. By perpetual easement and fee simple title, land rights for channel modification of the Little Black River in Arkansas; the oxbow loops will be acquired by fee simple title.
6. By fee simple title, 50 acres at the diversion structure, and an additional 50 acres by easement for mitigation of wildlife losses by Butler County Drainage District No. 10.
7. By special easement, grazing will be prevented along inside slopes and berms along ditch No. 3 and the floodway.
8. By special easement, the present habitat will be preserved in an area 30 feet wide along one side of all multiple-purpose flood control drainage ditches in Ripley County, Missouri, and Clay County, Arkansas, other than ditch No. 3.
9. Easements will be obtained from the State Highway Department for the modification of Highway 21 at structures C-7 and Highway 142 at structure F-3.
10. Easements will be obtained for the modification of powerlines at structures A-2, A-3, and F-2.
11. A pipeline easement will be obtained in the flood pool of structure B-9.

f. Environmental Considerations: Construction will be performed so that it will provide the greatest protection from soil erosion, minimize water pollution, protect fish and wildlife habitat, minimize forest losses, and preserve the natural beauty of the area. Weather conditions normally permit year-round construction which will allow more rapid project completion and timely seedings of disturbed areas. A construction operation plan for minimizing the effects of construction on the environment will be part of each contract. The following items will be included:

1. Size and duration of exposure of denuded areas will be minimized. Vegetative coverings will be planted

to prevent erosion, and construction schedules will encourage rapid completion of project segments.

2. Runoff from the construction site will be controlled to prevent erosion.
3. Sediment traps and debris basins will be installed where needed.
4. Temporary bridges or culverts will be used where fording is objectionable.
5. Diversion above all cut slopes will be required to prevent concentration of runoff across the exposed areas.
6. Embankment surfaces will be maintained in a manner that will minimize stream pollution if water should flow over the top.
7. The ditches will be constructed so that significant aggradation or degradation of the channel bed or erosion of the channel banks will not occur.
8. Ditch No. 3 will be constructed and the appropriate protection will be applied before diversion of water from the Little Black River will be permitted.
9. The drop structure and side inlet structures along ditch No. 3 will be constructed in advance or concurrently with the channel excavation.
10. Each section of channel will be completed before beginning work on subsequent reaches, and vegetative measures will be applied as excavation progresses.
11. Excavation on all ditches except ditch No. 3 will be limited to one side only, preserving existing vegetation on the alternate side.
12. Dust will be kept within tolerable limits.
13. Burning will comply with state regulations of Missouri and Arkansas. Utilization of cleared vegetation for fuel wood, posts, lumber, or other products will be encouraged to minimize burning.

g. Fish and Wildlife Mitigation Measures: Plantings for wildlife on both of the 30 feet wide inside slopes of the spoil banks will be established and maintained on ditch No. 3 and the floodway channel. A special easement clause will prohibit grazing inside the berms or on the spoil bank slopes. Mitigation plans for revegetation of these areas will be developed in cooperation with the Missouri Department of Conservation.

A special easement clause will preserve present habitat along a 30-foot wide strip on one side of all multiple-purpose flood control drainage ditches in Ripley and Clay Counties, excluding ditch No. 3. Construction will be from the opposite side; a 16-foot wide grassed berm will be established for maintenance access (see Figure 6).

In Butler County, 100 acres of delta land will be acquired by Drainage District No. 10 of Butler County. Preservation of this land will be in lieu of preserving wildlife habitat along multiple-purpose ditches, except ditch No. 3. Fifty acres of this land will be at the diversion structure on the Little Black River. The 100-acre area, with the exception of 14 acres used for construction of the diversion structure, floodway, and dikes, will be managed by the Missouri Department of Conservation through an agreement with Drainage District No. 10 of Butler County. Fifty-five acres of this total area are for mitigation purposes. Management of the diversion structure, water control structure at the oxbow, floodway, and dikes will be the responsibility of Butler County Drainage District No. 10 and Naylor Drainage District.

Fishery mitigation in ditches No. 1 and 2 will include an extra 2 feet of excavation of alternate 1,000-foot long sections of ditch bottom. This excavation will result in approximately a "V"-shaped ditch bottom and create impoundments for fish habitat. Approximately 6 miles of ditch No. 1 will be constructed in this manner beginning at the bridge on the north line of Sec. 28, T22N, R4E, and extending to the junction with ditch No. 3 in Arkansas. Ditch No. 2 will be constructed in the same manner and will be approximately 4 miles long beginning at the bridge on Highway H, Sec. 19, T22N, R4E, Missouri, and extending to the junction with the Little Black River. This measure will maintain approximately 6 acres of water in these ditches.

Mitigation measures on ditch No. 2 will also include a 100 c.f.s. capacity conduit in a levee at the break in the river bank in Sec. 24, T22N, R3E, to provide water for Lateral 2 and the lower reach of ditch No. 2. The lower end of Lateral 2 will be blocked at its junction with ditch No. 2 with a fill containing a pipe of 100 c.f.s. capacity set at the level needed to maintain the existing water level in Lateral 2. This measure will maintain approximately 11 acres of water in Lateral 2.

Allison's Slough, a 10-acre pool of water 1.2 miles long, will be maintained in the Hart ditch beginning approximately 0.25 mile above its junction with the Brown-Taft ditch. The channel below this pool will be graded from its junction with Brown-Taft to a high point upstream about 0.25 mile north of Brown-Taft. This high point will serve as a dam to preserve the upstream water area.

Gaines Slough, a 5-acre washout between the Little Black River and ditch No. 3 in Section 36, northeast of Naylor, will be preserved. This slough currently provides excellent habitat in the lowland and supports an important local fishery.

Four structures on ditch No. 3 will impound 175 acres of water for fishery habitat. Ports for fish in migration will be provided. Submerged and most herbaceous aquatic vegetation will not be discouraged from growing in these pools for fish cover.

The low flow and cool water characteristics of the Little Black River and the headwaters of Logan Creek will be maintained by installing two release ports in the principal spillway riser of structures located on perennially flowing reaches of these streams. Included in this group are structures A-3, B-9, C-7, D-2, and F-11. One release port will be located near the bottom of the riser and the other approximately 5 feet below sediment pool elevation. The combined capacity of the two ports will be 0.02 c.s.m. The release flows will be approximately 0.8, 0.9, 0.5, 0.2, and 0.4 c.f.s., respectively. These flows were computed from information provided by the U.S. Geological Survey gaging station near Naylor and are the best estimates available on currently encountered low flows at these sites (see Figure 2).

Outlets from structures located on intermittent stream tributaries to the Upper Little Black River, which flow more than 6 months of the year, will be designed to pull outfall water from the bottom of the sediment pools. At times when flow into the reservoir exceeds outflow (by leakage, evaporation, and the cold water release port), warm surface water will spill over the crest of the inlet. Included in this group are structures A-2, A-7, B-1, B-2, and D-4, all of which have individual drainage areas larger than 3 square miles in size.

Within the pools of the floodwater retarding structures, cleared vegetation will be used to build root wads and brush piles, for fishery habitat. The Missouri Department of Conservation will be requested to make recommendations on a site-by-site basis for location of these stacks of vegetative material.

The three loops of the Little Black River that are cut off by construction of the multiple-purpose channel system will be blocked at both ends and pipe culverts will be installed to maintain existing water levels for fishery habitat. These loops are located at the diversion

structure (Sec. 24, T23N, R4E) and at the proposed outlet of ditch No. 3 into the Little Black River (Sec. 14, T21N, R3E).

h. Public Recreation Development: A total of 1,311 acres will be purchased in fee simple title in association with structure B-9. This land will include 492 acres for sediment pool, recreation pool, part of the flood pool, dam and emergency spillway, and 819 acres for recreation and to insure full utilization of the recreational facilities. Flood easements will be acquired on an additional 154 acres. A total of 298 acres of water surface and 1,013 acres of land will be available for recreational use.

Recreation facilities will provide opportunities for a variety of activities for both short and extended visits. Facilities for beach swimming will include rest rooms with showers and parking areas. An area for picnicking will be developed with athletic fields and playgrounds. An overlook will emphasize the view over the lake to the bluffs and into the valley. Adjacent parking and picnicking facilities will also encourage sightseeing, and a nature interpretation area will be provided with bulletin boards and displays adjacent to a short nature trail. A boat launch will provide access for boating and fishing; there will also be parking areas for vehicles with boat trailers. Bank fishing will also be possible along the lake and the creeks below the dam, and a canoe access area will provide a "put in" point for floating. Facilities will also include sanitary and trash disposal facilities, playground equipment, and water, sewer, and electrical systems. All facilities will be of high quality, and will be designed and installed to be usable by the physically handicapped, in accordance with P.L. 90-480. The arrangement of recreational facilities is shown on the following Recreation Sketch Map (see Figure 7).

There will be three main access points into the park. An existing access developed by the Missouri Department of Conservation is located adjacent to the bridge on Highway K. This will be the access point for canoe "put ins" and for most of the bank fishing. A second access road will be located about 0.25 mile north of the first road; this will be the major entrance into the park. It will primarily serve the campground, picnic areas, park service area, and the overlook and will pass through the entire park. The latter part of this road will be in the group camp area. The third access will be 2 miles north of the first access on Highway K. This is an existing county road that will connect to a park road in the northeast section of the park. From there, it will lead down to the boat launch, swimming beach, and secondary service area.

These roads will be two-lane, gravel roads; directional and informational signs will be placed where needed and speed limits will be controlled.

All facilities around the reservoir, except the swimming beach and boat launch, will be installed above the flood pool elevation. In

FIGURE 7
UPPER LITTLE BLACK WATERSHED
RIPLEY COUNTY, MISSOURI
STRUCTURE B-9
RECREATION SKETCH MAP



ONE HOUR DRIVE OR 50 MILE RADIUS FROM PARK

SCALE 10 5 0 10 20 30 40 50 MILES

LEGEND

- | | |
|-------------------|-------------------------|
| ① PICNIC AREA | ⑪ WATER TOWER |
| ② PARKING | ⑫ NATURE TRAIL |
| ③ RESTROOM | ⑬ LOOKOUT |
| ④ PICNIC SHELTER | ⑭ NATURE INTERPRETATION |
| ⑤ CAMPGROUND | ⑮ TRAIL |
| ⑥ GROUP CAMP | ⑯ BANK FISHING |
| ⑦ SERVICE COMPLEX | ⑰ PLAY FIELD |
| ⑧ BOAT LAUNCH | ⑱ CANOE PUT-IN |
| ⑨ SWIMMING BEACH | ⑲ RESIDENCE |
| ⑩ CHANGEHOUSE | ⑳ FOOT BRIDGE |



SCALE 1/16,300
SCALE 800 400 0 800 1600 2400 FEET



addition, all facilities to be located between the dam and Highway K (except the day-use facilities, such as picnic tables and playground equipment) will be installed above the 100-year flood elevation.

In addition to the development at site B-9, a public recreation access area will be developed at the junction of the Little Black River and the floodway diversion. Fifty acres will be purchased for a 5 acre mitigation and a 45 acre recreation area. The recreation facilities will be developed on 2 acres and will include access to the Little Black River, roads, parking lots, and toilets (see Figure 3). Approximately 14 acres will be used for construction and the remaining 29 acres will be left in a natural condition. Sanitary facilities will meet state and local health standards. Necessary erosion control measures, including limited land shaping with grass and tree plantings, will be installed. The area will be acquired by Butler County Drainage District No. 10, who will enter into an agreement with the Missouri Department of Conservation for management. An access road will be constructed across the riprap section near the diversion structure to serve farmlands and the public access area located between the floodway and Little Black River. In addition to the 50 acres to be acquired in fee simple title at the diversion structure, easements will be obtained on an additional 50 acres for mitigation of wildlife by the Butler County Drainage District No. 10.

3. Operation and Maintenance: Land treatment measures will be maintained by landowners and operators of farms on which the measures are installed under agreements with the conservation districts. Representatives of the soil and water conservation districts and the Soil Conservation Service will periodically inspect land treatment measures to encourage landowners to perform needed maintenance.

Forest land treatment measures installed on private land will be maintained by the landowners with technical assistance furnished by the Missouri Department of Conservation - Division of Forestry and Arkansas Forestry Commission, in cooperation with the U.S. Forest Service under the Cooperative Forestry Program. The U.S. Forest Service will maintain measures installed on the Mark Twain and Clark National Forest lands.

Multiple-purpose structure B-9 and associated recreational facilities will be operated and maintained by the Missouri Department of Natural Resources, Division of Parks and Recreation. The estimated annual cost is \$7,352 for the structure, \$51,578 for the recreation facilities, making a total of \$58,930 annually. The above cost includes a replacement cost of \$19,178 for recreational facilities. Major items expected to be replaced include picnic tables, grills, trash can units, toilets, signs, and water supply facilities. Funds for these costs will be included in the annual budget for operating the State Park system. The domestic water supply used for the State Park will be monitored to insure that the water quality meets state standards.

Garbage and litter cans will be placed where needed according to design criteria and usage. They will be emptied and cleaned at regular intervals. Possible insect attraction areas will be sprayed for control. Rest rooms will be cleaned on established maintenance schedules. Vault toilets will be emptied on a schedule, with special disposal during heavy use periods. Mosquitoes at B-9 will be controlled by the standard method, utilizing pool level manipulation.

An agreement providing for operation and maintenance of structural measures and recreation facilities will be executed by the local sponsoring organizations before federal construction funds are made available. A separate operation and maintenance plan will be prepared for each similar group of structural measures.

The 24 floodwater retarding structures will be operated and maintained by the Little Black River Watershed Subdistrict. Funds will be obtained from tax levies in the watershed area.

The multiple-purpose structure B-9 and associated recreational facilities, including the residences, will be operated, maintained, and replaced by the Missouri Department of Natural Resources, Division of Parks and Recreation. Boating safety will be stressed and informational programs will be conducted by the appropriate agencies.

Items of maintenance for the reservoir structures will include, but not be limited to: replacing and repairing riprap, mowing embankments and spillways where necessary to control weeds, controlling woody vegetation, repairing rodent damage, and removing debris around the riser.

The gates on structures A-3, B-9, C-7, and D-2 will be operated manually by the watershed subdistrict in cooperation with the joint board of the Butler County Drainage District No. 10 and the Naylor Drainage District. The gates will normally be kept open but will be closed to minimize flooding along the floodway. A staff gage will be installed near the road bridge over the Little Black in the NE 1/4 of Section 24, T23N, R4E to control opening and closing of the gates. The gates will be closed when flow exceeds 1,900 c.f.s. at the staff gage. Individual and/or all of the gates may be opened when the discharge at the staff gage recedes to less than at 2,450 c.f.s. The individual structure gates will be opened within 5 days after pool elevation has dropped to the high stage elevation.

The Missouri portion of ditch No. 3, the diversion structure, floodway, and related mitigation features will be operated and maintained by the Joint Boards of Butler County Drainage District No. 10 and the Naylor Drainage District. The Arkansas portion of this channel, including the Little Black River and the mitigation features, will be operated and maintained by the joint boards of the two Missouri drainage districts and Western Clay Drainage District in Arkansas.

The Missouri portion of ditch No. 1 will be operated and maintained by the Naylor Drainage District. The portion of ditch No. 1 in Arkansas will be operated and maintained jointly by the Western Clay Drainage District and the Naylor Drainage District.

Operation and maintenance costs for the Gaines Slough Levee and the Harviell Levee will be shared by the joint boards of Butler County Drainage District No. 10 and the Naylor Drainage District.

All other channel modification, levees, and mitigation features will be operated and maintained by the drainage district within whose boundaries they are located. These costs will be borne by the responsible drainage district.

Operation and maintenance will include, but not be limited to: re-moving sediment deposits from the channel improvements; replacing and repairing riprap around the concrete drop structures; mowing side slopes and berms along the channels for control of undesirable species; repairing channel bank erosion; maintaining drop structures; floodwater retarding structures; and the diversion structure; controlling woody vegetation in the channels; maintaining the levees; and maintaining all mitigation features. Mowing and/or spraying of ditch side slopes and berms to control weeds and brush will be delayed until after July 15 to reduce wildlife losses. Herbicides used for spraying will be those approved by the U.S. Department of Agriculture and accepted by the Missouri Department of Conservation. Application will be made according to manufacturers recommendations. All future maintenance work will be accomplished with the same environmental consideration as planned for the original work.

Where latent defects become apparent, the Soil Conservation Service will share the cost of repair at the same rate as the original cost of construction, during the establishment period. For structural measures the establishment period shall extend 3 years from the date of acceptance of the structural works of improvement. The establishment period for vegetative work associated with a structural measure is the period from the date of acceptance of the initial vegetative work to midnight of the date on which the Soil Conservation Service writes the sponsor advising that adequate vegetative cover has been obtained. This period shall not, however, exceed two growing seasons or the end of the establishment period for the associated structural measures, whichever is greater in time.

The Soil Conservation Service and the sponsors will make joint inspections annually, after each severe flood, and after any other unusual condition which might adversely affect the structural and mitigation measures. These inspections will continue for 3 years following the installation of each structural work of improvement. Inspections will also be made by the sponsors after the 3-year period and a report furnished to the Soil Conservation Service.



Inspection of the floodwater retarding structures will include the condition of the principal spillway and its appurtenances, the emergency spillway, the earth fill, the vegetation, the riprap, and other items installed as a part of the structure. The inspection of the channel modifications will include the condition of the drop structures, embankments, channel side slopes, vegetation, side inlet structures, and other installed features. Levee inspections will include the condition of the earth fill, pipe conduit, vegetation, and other installed features. Inspection of the mitigation items will include the wildlife habitat plantings, the fishery pools in the channels, and management of other wildlife areas.

4. Project Costs:

PROJECT INSTALLATION COSTS ^{a/}			
Cost Item	PL-566 Funds	Other Funds	Total
Land Treatment	569,000	2,974,700	3,543,700
Construction	16,167,230	1,125,355	17,292,585
Installation Services and Project Administration	4,714,560	1,497,747	6,212,307
TOTAL PROJECT	21,450,790	5,597,802	27,048,592

a/ June, 1974





AERIAL VIEW OF FLOODING OF DELTA LAND AROUND NAYLOR, MISSOURI, IN 1969



Photo credit: Dally American Republic
Poplar Bluff Printing Co. Inc., Poplar Bluff, Mo.

REPRESENTATIVE VIEW OF MANMADE DITCHES CONSTRUCTED BY DRAINAGE DISTRICTS IN EARLY 1900'S. DEBRIS AND SILT HAVE CLOGGED THIS DITCH TO THE EXTENT DRAINAGE IS INADEQUATE. FLOOD FLOWS ARE LIKEWISE HELD UP. THIS DITCH WILL BE RENOVATED IN THE PROJECT BY DEEPENING AND SHAPING THE CHANNEL. CONSTRUCTION WORK WILL BE DONE FROM ONE SIDE TO PRESERVE TREES AND BRUSHY COVER ON OPPOSITE BANK FOR WILDLIFE HABITAT. APPROXIMATELY 20 MILES OF THESE MANMADE DRAINAGE DITCHES ARE IN THIS CONDITION WITH INTERMITTENT POOLS OF WATER WHICH ARE SHALLOW EXCEPT FOR A FEW HOLES.



TYPICAL VIEW OF LITTLE BLACK RIVER LOOKING DOWNSTREAM FROM BALL MILL BRIDGE APPROXIMATELY 1/2 MILE ABOVE DIVERSION STRUCTURE PLANNED IN THE PROJECT.



VIEW OF HABITAT ASSOCIATED WITH THE LITTLE BLACK RIVER BANK AT A LOCAL ACCESS POINT. THIS AREA WILL BE DEVELOPED FOR PUBLIC ACCESS BY THE PROJECT. THE LARGE TREES ARE BEECH TREES.

E. Environmental Setting

1. Physical Resource: The Little Black Watershed is located in Butler, Carter, and Ripley Counties in southeastern Missouri, and Clay County in northeastern Arkansas. Little Black River is a left-bank tributary to the Current River in the White River Basin which is a major tributary of the Arkansas-White-Red Water Resource Region. The drainage area contains 249,139 acres; 238,094 acres in Missouri and 11,045 acres in Arkansas. It is approximately 33 miles long and 16 miles wide, and approximately 27 percent is bottom land.

The watershed is primarily a rural area with a population of approximately 7,222. Towns in Missouri within the lower watershed include Naylor, population 586; Neelyville, population 231; Harviell, population 160; and Fairdealing, population 80. Success, population 266, is the only town in Arkansas within the drainage area. 1/ Towns located in the upper watershed are Hunter, population 129, and Grandin, population 243. Several small unincorporated communities are scattered throughout the area.

Doniphan, Missouri, the county seat of Ripley County, is located on Highway 160 near the western watershed divide and has a population of 1,850. Fairdealing in the central part of the watershed is approximately 125 air miles south of St. Louis. Poplar Bluff, Missouri, the county seat of Butler County, Missouri, has a population of 16,653, and is located 17 miles northeast of Fairdealing.

The Little Black River is located in the Current River Subbasin of the Arkansas-White-Red Water Resource Region. Two major divisions comprise the region. The region is primarily Land Resource Area 116, Ozark Highland, which consists of open and high hills with about 60 percent covered with forest, 20 percent used as cropland, and pasture occupying the remaining 20 percent. The other major division in the region is Land Resource Area 131, Southern Mississippi Valley Alluvium, which is located in the lower part of the basin known locally as the delta area.

All of the area northwest of the Little Black River, except a narrow band paralleling the channel ranging from 100 feet to a mile wide at the State line, is located in the Ozarks Physiographic Province. This region consists primarily of rolling hills with approximately 75 percent of the area covered with forest. Local relief in the upland ranges from 40 to 120 feet. The relief in some areas adjacent to the Little Black River range up to 180 feet. Flood plains associated with streams in the upland range in width from 300 to 2,000 feet.

The land southeast of Little Black River is in the Southeastern Lowlands Physiographic Province, locally referred to as the delta. The delta consists of a broad arm of the Gulf Coastal Plain which extends up the valley of the Mississippi River from the Gulf of Mexico to southeastern Missouri. The delta ranges from level to depressional with scattered gently undulating sandy ridges and

hummocks. All of the watershed located in Arkansas, except a few acres near the State line, is in the delta.

Soils in the watershed are divided into two major categories based on the material in which they were developed. The soils in the uplands and foothills along the escarpment were developed from residuum. The soils in the bottom land along the tributaries and the delta area were developed in the alluvium. A description of each of these major areas follows:

The dominant soils ^{a/} on the narrow to moderately wide ridge tops of the uplands are of the Captina and Wilderness series. The dominant soils on the steep side slopes of the uplands are of the Clarksville and Doniphan series.

The Captina and Wilderness series consists of moderately well-drained soils with fragipans at a depth of 17 to 24 inches. Captina soils have silt loam surfaces and silty clay loam subsoils above the fragipan. Wilderness soils have cherty silt loam surfaces and very cherty silty clay loam subsoils above the fragipan.

The Clarksville series consists of deep acid somewhat excessively drained soils with very cherty silt loam surfaces and very cherty silty clay loam subsoils. The Doniphan series consists of deep, well-drained soils with very cherty silt loam surfaces and clayey subsoils.

A band of soils along the foothills at the escarpment, ranging from 0.5 to 5 miles or more in width, were developed in coastal plains materials. These soils occupy the area immediately below the Ozark Highlands and above the delta flood plains. The soils on the gentle slopes in this area have properties similar to those of the Captina soils. The strongly sloping and steep soils of this area have properties similar to those of the Clarksville soils.

The dominant soils of the delta area are of the Calhoun, Falaya, Amazon, Bosket, Tuckerman, and Sharkey series. All of these soils are nearly level and are developed in the thick alluvial deposits. The Bosket soils are well-drained and have fine sandy loam surfaces and sandy clay loam subsoils. The Falaya soils are somewhat poorly drained and have silt loam texture throughout. The Tuckerman, Sharkey, Amazon, and Calhoun soils are poorly drained. The Tuckerman soils have fine sandy loam surfaces and sandy clay loam subsoils. The Sharkey soils are clayey throughout. The Amazon and Calhoun soils have silt loam surfaces and silty clay loam subsoils.

^{a/} The soil names used here are subject to change when the soil mapping and soil correlation is completed for the area. Soil series interpretation sheets are available.

The general soil map is being revised and will be available in March 1975. A detailed soil survey report is scheduled to be published in 1980. Individual soil survey maps are available for reference in the local field offices for most of the area.

Bedrock of lower Ordovician Age underlies the upland area. The Jefferson City formation is present in the southern third and the Roubidoux formation in the northern two-thirds. Through the central part of their courses, both the Little Black River and the Beaverdam Creek have incised through the Roubidoux into the Upper Gasconade formation. The Roubidoux formation is composed of beds of sandstone, chert, and interbedded fine-grained dolomite and cherty dolomite. The Jefferson City and Gasconade formations are coarse to fine-grained silty and cherty dolomites. Bedrock below the alluvium in the delta area contains thin Cretaceous or Tertiary strata over Paleozoic rocks. The residual overburden (residuum) which blankets bedrock varies greatly in composition and depth. Well logs in the watershed and surrounding area show a range from 20 to 160 feet in residuum depth. The residuum is principally a stony clay with chert and some sandstone and limestone. Rock particles range in size from sand and gravel to boulders. The residuum may range from rock-free clays and silts to units largely composed of rock fragments. The delta alluvium ranges to depths of 75 feet or more.

The highest elevation in the watershed is found in the extreme northern part and is approximately 800 feet above mean sea level. Little Black River enters the delta at an elevation of approximately 307 feet. At the junction of the Little Black and Current Rivers the elevation drops to its lowest point, approximately 280 feet.

The watershed is in the humid region with annual precipitation averaging 47.01 inches. Mean temperature varies from 37.5 degrees in January to 79.9 degrees in July. Maximum annual precipitation of 75.24 inches occurred in 1927. Minimum annual rainfall was 31.83 inches in 1954.

Mean annual temperature	58.8 degrees
Maximum temperature	114 degrees
Minimum temperature	-24 degrees
Last killing frost in spring (avg.)	April 7
First killing frost in fall (avg.)	November 2
Length of growing season (avg.)	209 days

Average distribution of precipitation is as follows:

<u>Seasons</u>	<u>Months</u>	<u>Precipitation (Inches)</u>
Spring	March, April, May	13.81
Summer	June, July, August	11.97
Autumn	September, October, November	10.82
Winter	December, January, February	10.41

The known mineral resources are limited to sand, gravel, clay, manganese and iron. 2/ Manganese generally occurs northward from an east-west line 1 to 2 miles south of Hunter, Missouri. "In spite of the wide spread occurrence of manganese in southeastern Missouri, the very small size and low grade of known deposits, and the poor experience to date with attempts to make acceptable concentrates by mechanical methods, do not encourage optimism for significant future production." 3/ The entire watershed is within the area of occurrence of limonite iron ore. Several small prospect pits are within the watershed, but prospecting has not been done for many years. "The brown ores of the Ozarks are accumulations of limonite, also derived at least in part from sulfides, that have been mined extensively but have only a minor and decreasing importance today." 3/

"Clay is mined in the region by A.D. Willis and Sons, Industries, Poplar Bluff, Butler County for the production of red and buff face bricks. The main clay pit is located at the company's brick plant in the northeast part of Poplar Bluff. The company also mines clay from two other pits; one about two miles southwest of Poplar Bluff and the other in Stoddard County. The Willis Company has been the only continuous producer in clay in the region for many years. A small amount of white burning clay was mined during the period 1959-1962 from a pit 4 miles southwest of Poplar Bluff by the Ozark Development Company. The clay was shipped to Ohio for the manufacture of chinaware. Active mining ceased about 1962; however, the company still controls the property. Other small deposits of white burning clay are known in Butler County and several were mined in the late 1800's and early 1900's. Present clay resources are limited and would not support a major brick manufacturing industry." 41/

"Chief sources of sand and gravel in the region are the alluvial deposits on the Black, Current, and St. Francis Rivers and their tributaries. Sand resources and perhaps limited amounts of gravel are present in the southeast lowland area of Butler County, extreme southeastern Ripley County, and northern Clay County, Arkansas. A drawback to these deposits is that they are overlain by appreciable amounts of clay and that they contain lignite." 41/ Only one sand and gravel pit was observed in the Little Black River Watersheds, this abandoned pit is located on the bluffs southwest of Harviell. Present sand and gravel production in the area is from three producers along the Black River in Butler County.

Much of the watershed area is underlain by stone deposits, though stone meeting specifications for high quality aggregate is not normally found. Stone is not mined or quarried in either of the watersheds.

There is no oil or natural gas production from the Little Black River Watersheds or any nearby surrounding areas. "In the Mississippi embayment area, very little deep drilling has been attempted and the

possibilities of oil and gas occurrences in commercial quantities have not been sufficiently tested." 41/

Ground water is of acceptable quality. It is used for domestic purpose and irrigation and is present at moderate depth. Yields range from 150 to 600 gallons per minute, and dissolved solids are usually less than 1,000 parts per million. Water from shallow wells is available in the extreme lower portion of the flood plain. In the flood plain above Highway V, irrigation water would be available from the Little Black River. Water is readily available from shallow wells in the delta area. The water yields range from 200 to 1,000 g.p.m. The water quality is good with relatively low salts and dissolved solids (300 to 500 parts per million).40/

The soils in the delta and flood plains along streams are generally suited to irrigation provided adequate drainage systems are developed. Those crops most suitable; such as corn, sorghums, soybeans, rice, and cotton, are readily adaptable to the delta area.

Although the annual rainfall usually exceeds 40 inches, periods of drought occur most years during the growing seasons. This drought period, lasting from three to six weeks significantly reduces crop yields.

Irrigation development increased over 300 percent in Butler and Ripley County from 1964 to 1969, 3,296 acres to 10,305 acres. During 1969, over 11,000 acre feet of water were used for irrigation purposes. The existing irrigation systems have minimum development. Land forming has not been practiced because of the scour and sedimentation damages caused by flooding. Much of the water used at present is pumped from the Little Black River and is applied by furrow method to corn and by the flooding method to rice. With adequate flood control and drainage system development, the delta soils could be developed for more intensive irrigation. Because of the high flood frequency and the poor drainage outlets, landowners have not felt justified to make the expenditures necessary for irrigation system developments. At the present time there are very few irrigation developments within the upper watershed area; however, there is potential in the immediate flood plain area.

Since towns in the watershed are small (less than 200-600 population) with no large water-using industries and the population is relatively stable, the demand for additional water supply is not great. Most small towns and rural residents rely on shallow wells for water supplies. Several of the water systems in the small towns are not approved by the State Health Department, a water district serves some rural residents and small towns.

Land use in the upland is primarily forest land and the bottom lands and delta are predominantly cropland. A breakdown of land use is shown in the following table:

Land Use	UPLAND		BOTTOM LAND ^{a/}		TOTAL WATERSHED	
	Acres	Percent	Acres	Percent	Acres	Percent
Cropland	9,629	5	51,973	76	61,602	25
Pastureland	20,036	11	8,616	12	28,652	11
Forest Land	141,916	79	4,511	7	146,427	59
Other Land	9,030	5	3,428	5	12,458	5
TOTAL	180,611	73	68,528	27	249,139	100

^{a/} This area includes 9,334 acres of bottom land associated with tributaries in the upland, and the remainder is located in the delta.

Clearing of the bottom land hardwood forest areas in the delta began in the early 1900's. Construction of county court drainage ditches took place between 1910 and 1930 and was followed by additional clearing. Approximately 75 percent of the forest land in the delta was cleared prior to World War II, and an additional 10 percent has been cleared since that time.

The forested land in the delta, except for narrow strips along the drainage ditches and Little Black River, consists of tracts ranging from 2 to 320 acres with the majority less than 40 acres in size. The following table identifying only tracts larger than 40 acres was prepared from an analysis of aerial photos dated 1966 in Butler County, Missouri; 1968 in Ripley County, Missouri; and 1971 in Clay County, Arkansas.

FORESTED TRACTS	BUTLER COUNTY	RIPLEY COUNTY	CLAY COUNTY
40 to 80 acres	29 tracts	19 tracts	2 tracts
80 to 160 acres	0 tracts	5 tracts	5 tracts
160 to 320 acres	1 tract	1 tract	2 tracts
320+	0 tracts	0 tracts	0 tracts

Forest stands cover 146,427 acres of the watershed area. Oak and hickory hardwoods make up 79 percent of this total and bottom land hardwoods make up 12 percent. Mixed oak-pine stands total 6 percent, and the remaining 3 percent consists of shortleaf pine. About 12 percent of the forest stands are in saw timber size, 58 percent are in pole size, and 30 percent are in seedlings and saplings.

About 17 percent (30,000 acres) of the upland area is open land ranging from managed croplands and pastures to old field vegetation. The delta area is largely cropland, and natural vegetation occurs along drainage ditches and in scattered woodland tracts. Sweet gum, water oak, cottonwood, sycamore, and hackberry are the dominant trees in such areas. Cypress trees occur in many of the drainage ditches or depressions that occur among sandy knolls.

The drainage pattern is dendritic with major streams flowing to the southeast. The Little Black River begins in Carter County near Hunter, Missouri, and flows southeastward. Beaverdam Creek, the major tributary, joins Little Black approximately 2 miles north of Highway 160. From Highway 160 the river course turns southwest, flows across the delta, and joins the Current River in Clay County, Arkansas, near Success. Other tributaries to Little Black River include South Prong Little Black River, North Prong Little Black River, and Flat Creek. They are unmodified, well-defined natural streams that have intermittent flow.

Little Black River as it leaves the uplands follows the trend of the Ozark Escarpment. It enters the lower watershed approximately 2 miles northeast of Naylor and follows a strongly meandering southwest course to its confluence with the Current River near Success, Arkansas. Principal tributaries are Harris, Logan, Cypress, and Caldwell Creeks, and Buzzard Run. These are unmodified, well-defined natural streams that have perennial flow in lower reaches. Other intermittent unnamed streams have a combined length of 30 miles.

The Little Black River heads in the Upper Ozark Highlands in the Upper Little Black Watershed where it is a high gradient spring-fed stream. Streams which serve drainage areas of less than 15 square miles are generally intermittent. As drainage is accumulated or lower elevations are reached, Little Black becomes a perennial stream. The channel throughout the upland region has a gravel bottom, clear water, and a pool and riffle pattern. As the river leaves the upland, the stream changes character. A transition section is present in the area from approximately 1 mile above to below U.S. Highway 160. In this section, the water becomes more turbid, deeper, and generally more sluggish. The channel bed changes from gravel to fine sand to silts and clays and begins to meander. The meandering nature is maintained from this point to the outlet of the Lower Little Black Watershed in the Current River approximately 26 miles downstream.

The delta is served by a system of manmade ditches which were built by drainage districts between 1910 and 1930. Ditch No. 1 (11.2 miles) has 7.1 miles of intermittent flow and serves only landowner-constructed private ditches. It was built between 1910 and 1912.

Ditch No. 2 (9.7 miles) has 5.6 miles of intermittent flow. The rest of ditch No. 2 and Birdslash lateral (2.7 miles) are ephemeral-flow ditches. An additional 1.4 miles of intermittent flow occur in

lateral No. 2 which in turn carries overbank flows of Little Black River into ditch No. 2. Ditch No. 2 was built during the period 1910 and 1915. It joins the Little Black River approximately one-half mile above the State line. The two laterals were built in 1920.

Ditch No. 3 (11.7 miles) is an intermittent-flow ditch built in 1915 to serve as an outlet for several laterals in Butler County. Laterals which outlet into ditch No. 3 are Brown Taft (4.5 miles), Harviell (9.3 miles), Neelyville (7.2 miles), and the Eaton ditch (3.0 miles). These laterals sustain about 9 miles of intermittent flow with the remainder being ephemeral. They were built during the 1920's. Other ephemeral-flow lateral ditches that discharge into these laterals were built in the late 1920's and early 1930's. These include the Hart (0.8 miles), Epps (2.4 miles), Sappington (2.4 miles), W.P.A. (2.2 miles), and the Suder ditch (6.0 miles). Ditch No. 3 extends southward to the Arkansas State line; then west (on the state line) where it joins ditch No. 1. These two ditches after joining are known as the State-Line ditch. It continues approximately 2.5 miles to its junction with the Little Black River. Approximately 1.5 miles south of the State line, State-Line ditch is joined by the Indian Creek ditch (3.8 miles) which is an ephemeral-flow ditch built in 1920. The lower 2-mile portion of State-Line ditch, starting 0.5 miles below the State line, contains perennial-flow.

Indian Creek ditch is in the Western Clay Drainage District in Clay County, Arkansas. The county court drainage districts in Ripley County remained inactive with no regular maintenance programs since this construction until the recent organization of a new circuit court drainage district, known as Naylor Drainage District. This district covers all Ripley County ditches, including the existing Little Black River. Ditches in Butler County, except for Eaton ditch, have been organized into circuit court drainage district, Butler County No. 10. Some maintenance has been carried out on these ditches on an intermittent basis.

The following table summarizes drainage ditches and area drained by each in the delta area:

DITCH	RIPLEY	BUTLER	CLAY	TOTAL
	Sq. Mi.	Sq. Mi.	Sq. Mi.	Sq. Mi.
Brown Taft	-	5.75 ^{a/}	-	5.75
Harviell	-	12.30 ^{b/}	-	12.30
Neelyville	0.94	10.94	-	11.88
Eaton	2.99	1.10	-	4.09
Indian Creek	1.38	-	3.84	5.22
Ditch No. 1	11.03	0.08	1.33	12.44
Ditch No. 2	11.59	0.33	-	11.92
Ditch No. 3 (excluding all laterals)	6.95	3.39 ^{c/}	4.30	14.64
Little Black River (draining into river from East side)	3.01	0.75	2.63	6.39
Little Black River (draining into river from West side)	2.58	0.38	4.90	7.86
TOTAL (Square Miles)	40.47	35.02	17.00	92.49
(Acres)	25,901	22,413	10,880	59,194

a/ Does not include 1.39 square miles of foothill drainage.

b/ Does not include 2.78 square miles of foothill drainage.

c/ Does not include 0.29 square miles of foothill drainage.

Water quality information for the Lower Little Black Watershed was obtained from two sources. A water quality and stream gaging station is maintained near Naylor on Little Black River. During the spring of 1974 the Midwest Research Institute (MRI) generated additional data at five stations in the project area. ^{4/} Samples were taken during three periods: January 29; March 12 and 13; and May 1, 1974.

Eighteen water quality parameters were assessed on samples from each of the three trips. Some of the parameters examined were: dissolved oxygen, ammonia and organic nitrogen, total phosphate, total alkalinity, total hardness, total dissolved and suspended solids, turbidity, temperature, pH, BOD, total and fecal coliform, and pesticides. All of the above parameters met existing state and federal water quality standards

except: (1) total phosphates exceeded federal standards of 0.1 mg/liter in all stations, (2) turbidity was higher in some instances than the Arkansas standards of 50 Formazin Units, and (3) the standards for fecal coliform (200/11 ml) were exceeded at the one station in Arkansas. Those Missouri stations of which coliform counts were found to exceed standards are generally in the delta area. Analysis of three sediment and water samples was made for detection of pesticide accumulation or occurrence. Chlorinated compounds appear to be in acceptable concentrations and organo-phosphorus compounds were not detected at any of the three stations sampled in late April 1974. Refer to page 56 for a discussion of the biological aspects of water quality. A more complete discussion of water quality in Little Black drainage is provided by the MRI Report.^{4/} (For a summary of data, see Appendix E.)

The water quality data from the Naylor station has been compared to a similar station at Doniphan on the Current River.^{4/} Current River is a larger stream of which Little Black is a tributary. The Doniphan station is located only a few miles above the Current River's confluence with Little Black. The following parameters were compared: maximum temperature, fecal coliform, maximum dissolved oxygen, pH, dissolved nitrates and ammonia, maximum phosphates, dissolved solids, total hardness, and maximum color. It is concluded from the comparison of the data that the surface water of the Current River is superior to that of the Little Black River at the reported sampling stations.

"Because there are no known sewage effluents entering the Little Black River or its tributaries, and because high concentrations of phosphate were detected in the spring-fed upper watershed, it is possible that the source of the chemical is the result of leaching of geological formations. Agricultural fertilizer applications do not appear to account for the concentrations of the chemical found throughout the watershed at the seasons sampled."^{4/}

No areas of wetland type I, as defined in "Wetlands of the United States," U.S. Department of Interior, Circular C-39,^{5/} are found in the watershed. The Wetlands Inventory of Missouri, classes seasonally flooded agricultural land as I-A and does not include this group in the inventory. A large part of the delta area is in the I-A classification. The areas are not delineated because they are dispersed throughout the flood plain. There are no areas in the watershed classed as wetland type II or higher.

Cane Creek, a 218,000-acre watershed, borders Little Black Watershed on the east. The two watersheds are separated by a low topographic divide in the delta area. Floodwaters of approximately 2-year frequency or larger from Cane Creek cross the divide on the north edge of Harviell, Missouri. When floodwater enters the Little Black delta area from Cane Creek, it continues as overland flow or drainage ditch flow to the Little Black River.

2. Present and Projected Population: Total population in the four counties comprising the watershed area has been constantly declining

since 1940. As shown in Table 1, population in the region was 81,494 in 1940; by 1970 it had dropped to 65,981, or only about 80.9 percent of the population three decades ago. ^{4/} In contrast, population in the U.S. has been increasing at an average rate of 15.6 percent each decade since 1940.

In 1970, most of the population in the four-county region was located in Butler County (Table 1); Clay County has 28.4 percent, and Carter County had only 6.0 percent of the regional population in 1970. Most of the area of the watershed is located in Ripley County, which experienced a continuous population decrease from 1940 to 1960, then unexpectedly increased between 1960 and 1970.

TABLE 1 ^{4/}

POPULATION CHANGES IN THE U.S., THE LITTLE BLACK RIVER REGION,
AND WATERSHED AREA, 1940-1970

	<u>1940</u>	<u>1950</u>	<u>1960</u>	<u>1970</u>
U.S. (in 1,000)	131,669	150,697	179,323	203,212
Four-County Region	81,494	80,572	68,983	65,981
Butler	34,276	37,707	34,656	33,529
Carter	6,226	4,777	3,973	3,878
Ripley	12,606	11,414	9,096	9,803
Clay	28,386	26,674	21,258	18,771
Watershed Area	9,180	9,076	7,201	7,433
Butler	2,359	2,333	2,038	1,909
Carter	606	599	533	493
Ripley	6,041	5,972	4,453	4,891
Clay	174	172	177	140

Source: Census of Population, 1940-1970 ^{1/}

Population projections over a long period of time for small counties, such as the four under consideration, are not highly reliable. A small change in population may result in a large error in projection and small changes can be brought about by any unexpected factor; such as a new manufacturing establishment, a vacational country club, an extended highway, etc. Long-range population projections are always subject to social, economic, and environmental condition changes. This section presents three series of population projections in the four counties for the years 1980 to 2020. Long-range projections are made only for purposes of reference and should be revised or modified constantly as new data or more reliable sources of correction become available.

The validity of projections depends substantially upon the underlying assumptions of the projection model. In this study, it depends on

the national population projections and the regional population shift-share patterns among counties in the past three decades. 4/ The Bureau of Economic Analysis, Department of Commerce and the Economic Research Service, Department of Agriculture (OBERS) have prepared projections on population, income, and employment in the U.S. for the Water Resource Council. Three population projections in this section were partially generated from the OBERS projections. a/ A shift-share analysis was then performed for population changes between the economic regions defined in the OBERS study and the Little Black River region. The component share changes were established and applied to the years from 1980 to 2020. From these results population projections for the Little Black River Watershed and the four counties were finally derived.

Table 2 contains the three series reflecting high, median, and low population projections for the four-county region and the watershed area. 4/

In summary, population in the U.S. is projected to rise continuously in the future, though with a decreasing rate, whereas population in the Little Black River region and the watershed area will decline throughout this century. 4/ Butler is the only county in the region showing a future population increase. Clay and Carter Counties will show population decreases, while Ripley County will probably stabilize its population. However, the proportion of Ripley County's population in the watershed area may grow significantly as a result of the growth in the Doniphan area.

3. Economic Resources: The economy of the watershed is based largely on agriculture. Most farm operations are diversified livestock and grain farms. Land use changes abruptly between the bottom land (68,528 acres) and the upland (180,611 acres). The primary land use in the upland is forest and pasture, and cropland in the bottom land.

a/ The OBERS projections on population for the U.S. are much higher than the recently revised population projections Series C, D, and E of the Bureau of the Census. The revision was made due to the recent sharp decline in fertility. In addition, they are also higher than those projected by MRI through a time--series regression model. (The linear least-square model shows a trend coefficient of 2.39 with respect to time, whose standard error was 0.049 and the coefficient of determination was 0.996. Projection Series 1 for U.S. was produced through the employment of this model.) In the light of this discrepancy for U.S. projections, the OBERS projections for the Little Black River region were adjusted downward accordingly.

TABLE 2

POPULATION PROJECTIONS FOR U.S., THE LITTLE BLACK RIVER REGION
AND THE WATERSHED AREA, 1980-2020

	U.S. (Millions)	Four-County Region					Watershed Area				
		Total	Butler	Carter	Ripley	Clay	Total	Butler	Carter	Ripley	Clay
Series 1											
1980	228.6	64,290	34,558	3,411	9,396	16,925	7,199	1,901	413	4,783	100
1990	252.5	63,188	35,701	3,096	9,036	15,355	7,015	1,892	356	4,690	77
2000	300.4	67,899	40,264	2,988	9,506	15,141	7,469	2,053	326	5,029	61
2020	348.4	67,653	43,704	2,368	8,930	12,651	8,364	3,180	234	4,912	38
Series 2											
1980	227.6	64,025	34,416	3,397	9,357	16,855	7,168	1,893	411	4,763	101
1990	262.8	65,473	36,992	3,208	9,363	15,910	7,268	1,961	368	4,859	80
2000	296.7	67,066	39,770	2,951	9,389	14,956	7,377	2,028	322	4,967	60
2020	374.8	72,770	47,009	2,547	9,606	13,608	7,785	2,209	252	5,283	41
Series 3											
1980	221.9	62,444	33,566	3,313	9,126	16,439	6,991	1,846	401	4,645	99
1990	244.6	60,968	34,447	2,987	8,719	14,815	6,769	1,826	344	4,525	71
2000	262.8	59,436	35,246	2,615	8,321	13,254	6,537	1,797	285	4,402	55
2020	295.3	57,347	37,046	2,007	7,570	10,724	6,136	1,741	199	4,164	31

Sources: U.S. series 1 was obtained through a time-series regression model; series 2 and 3 are from the Bureau of the Census, Population Estimates and Projections (Series P-25, No. 493, December 1972), Series D and F. For county and regional projections, see text.

There are approximately 2,116 landowners in the watershed. About 1,135 are farm units, and the remainder are small acreages used for rural residences, hunting cabins, etc. Farms by size are as follows:

Size of Farms	Number of Farms
Less than 40 acres	407
41 - 80 acres	240
81 - 120 acres	137
121 - 160 acres	110
161 - 320 acres	160
320 acres plus	81
TOTAL	1,135

In the 5-year period between 1964 and 1969, the trend has been toward fewer farm owners with larger farms. 4/ Most of these farms are family-oriented units and 90 percent are owner-operated. Very little outside help is used with less than 6 percent of the farms using more than 150 man-days of hired labor each year. In fact, a 1969 Ripley County census showed that 63 percent of the farmers worked off the farm for some portion of the year and 34 percent worked at least 200 days off the farm. 6/

The bottom land is used for agricultural crops in the following proportions: soybeans, 44 percent; corn, 15 percent; cotton, 10 percent; alfalfa, 6 percent; and wheat, 3 percent. The remaining 22 percent is in pasture, forest, and miscellaneous uses. Typical per acre yields are 25 bushels soybeans, 60 bushels corn, 400-500 pounds cotton, 2 to 5 tons alfalfa, and 35-40 bushels wheat. Since a large part of the bottom land is affected by the water problem, yields vary widely from year to year. Most of the feed grain and hay produced in the area is marketed through livestock, and the cotton and soybeans are sold as cash crops. Market outlets are available through farmer-owned cooperatives, local livestock auctions, slaughter facilities, and regional outlets outside the watershed. These facilities are adequate for the limited marketing needs of the agricultural sector of the watershed.

Double cropping is used on some fields by following wheat with soybeans. This practice is not extensively used at present but will probably increase in the future. Flood protection will enhance the possibilities for this cropping system.

Because most of the bottom land is affected by floods, yields vary widely from year to year. Since most croplands are located within the problem area, farm income is severely affected.

CROPS GROWN ON DELTA LAND



TYPICAL SOYBEAN FIELD. THE PREDOMINANT ROW CROP.



ANOTHER MAJOR CROP. CORN WHICH IS BEING IRRIGATED. IRRIGATION LIMITED BUT INCREASING.



HARVESTING A TYPICAL RICE FIELD. A HIGH VALUE CROP.



A COTTON FIELD. READY FOR HARVEST.



THIS STAND OF HARDWOOD SHOWS TYPICAL GROWTH ON MUCH OF THE UPLAND AREA.



CYPRESS TREES STILL REMAIN IN SCATTERED AREAS THROUGHOUT THE DELTA.



TYPICAL PASTURE SCENE REPRESENTING THE LAND USE FOR APPROXIMATELY 11 PERCENT OF THE WATERSHED. PASTURE IS AN IMPORTANT USE ON BOTTOM LAND ASSOCIATED WITH THE UPLAND.



SCATTERED PINE STANDS ARE LOCATED THROUGHOUT THE WATERSHED.

The market value of all agricultural crops sold as shown on a per farm basis is \$4,000 to \$7,000 below the state average for Missouri counties, and \$5,000 below the state average for Clay County, Arkansas. 4/ Fifty-two percent of all farms had sales of less than \$2,500 annually.

Local markets are good for saw logs, stave bolts, pine posts, poles, decking, flooring, railroad ties, walnut veneer, and wood chips. Charcoal wood, pulpwood, pallet and handle blank material are also marketable.

The forest land in Arkansas and Missouri is controlled by an estimated 760 private owners. The average-size private forest ownership is approximately 190 acres. Forest fire protection is provided by the Arkansas Forestry Commission and the Missouri Department of Conservation, Division of Forestry, in cooperation with the U.S. Forest Service through the Clarke-McNary Cooperative Forest Fire Control Program. There are 5,767 acres of land in public ownership consisting of the National Forests of Missouri (Mark Twain and Clark, 3,115 acres), and the state land, 2,652 acres.

Land values range from \$100-\$200 per acre in the upland and \$300-\$600 per acre in the bottom land. The increased demand for small tracts of land in the upland to be used for home sites and hunting areas is exerting an upward influence on land values, and they are expected to increase.

The watershed is served by a network of county and state roads. Major highways are U.S. 160 and U.S. 67. Several interstate truck lines serve the area via these routes. Rail facilities are furnished by the Missouri Pacific Railroad. A 20-inch crude oil pipeline owned by Mobil Oil Company crosses the project area.

The watershed is economically depressed. 4/ It had a relatively smaller working age population, a lower labor force participation rate and a higher unemployment rate than the U.S. as a whole. Most people employed work for manufacturing or retail trade industries. This region has a higher percentage of workers engaged in retail trade than the nation as a whole, and the proportion of agricultural employment in the area was about three times as high as the U.S. average.

Median income in the counties was well below the U.S. average of \$9,950. 4/ In 1969, Carter County had the lowest median income, only \$3,858. Mean income in all counties was higher than the median income, yet still far below the national average. The mean family income in Ripley County was only \$5,131 which is 46.6 percent of the U.S. average. Carter County had the highest family income among the four counties, \$7,482 or 68 percent of the U.S. value of \$10,999. The poverty level for a family of four was set at \$3,745 by the

Department of Commerce. ^{4/} The percent of families with income less than the poverty level in the Little Black River counties was two to three times higher than the nation as a whole. Carter County, the best of the four counties, still has 24.2 percent of its families living under the poverty level. In contrast, more than one of every three (or 36.4 percent) families in Ripley County was suffering from poverty.

Local governments provide public goods and services such as education, police and fire services, street and road maintenance, etc. The quality and quantity of these public goods and services are represented by the expenditures per capita in any particular year. A static one-time analysis of revenues and expenditures per capita, which have been frequently employed to measure the output of local governments, may be considered informative and serve as a useful indicator. The latest official document available is the Census of Governments, 1967. ^{7/} A comparison using 1967 data was made of three counties in the Little Black River region to the U.S. average; statistics for Butler County are not available.

While per capita general revenues for all county governments in the U.S. in 1967 totaled \$72, Carter County had only \$17, about 23.6 percent of the U.S. average. ^{4/} Ripley County was the highest among the three, yet still 37.5 percent below the national level. Revenues from taxes were about \$10 per capita for the counties in the region, as compared to \$33 in the nation. The low tax revenues resulted primarily from a low tax base as reflected by the productivity and income comparisons described previously. As a consequence, expenditures per capita were also very low since balanced budget has traditionally been stressed by county governments.

The watershed is located in the Ozarks Development Region (OZARKA). The Missouri portion is located in the Ozark Foothills Regional Planning Area. A resource conservation and development (RC&D) project application is being prepared which will include all of the watershed area in Missouri. The Ozark Foothills Regional Planning Commission has endorsed this application and taken the lead in providing information to sponsors of the project. It is also coordinating collection of information and helping organize the RC&D Steering Committee.

4. Plant and Animal Resources: The flora of the watershed is diverse. ^{4/} In the delta, in association with the hydric environment along the Little Black River and the ditches, plant communities are probably representative of the original vegetation, if not in age, at least in species composition. Here there is often an overstory of oaks, gums, and bald cypress which form a canopy over a diverse and lush subordinate shrub and forb community.

The overstory of the foothills and the Ozark uplands, for the most part, are typically oak-hickory climax. ^{4/} In the higher portion of the drainage, which is typically the more arid portion of this

area, shortleaf pine becomes a prominent species in the present timber stands. This is a consequence of past fire history and the effects of secondary succession.

Timber harvest throughout the drainage, at least on the privately-owned lands, appears to have been essentially unregulated. Probably, through a system of harvesting the most desirable trees over a relatively long-time span, the species composition of many of the stands has shifted to a preponderance of the less desirable varieties, such as blackjack oak, and others which have either a slow growth rate or poor form which makes them less desirable for commercial purposes.

Areas of the uplands, and to a degree in the delta, which have been cleared, now have a vegetative composition of predominantly broomsedge (Andropogon virginicus), and shrub and tree regeneration. This circumstance is often the result of overgrazing or from the abandonment of "worn out" agricultural land. Other areas which have been cleared of native vegetation are now in improved pasture, and where conservation practices have been observed, appear productive. 4/

Differences in the physiographic nature of the watershed are reflected in the distributional relationships of the aquatic fauna. 8/ That portion of the watershed lying north of U.S. Highway 160 lies within the Ozark Uplands physiographic region. This portion is largely in the upper watershed project but is a part of the aquatic system affecting Lower Little Black. This area includes all the higher gradient, cooler, headwater reaches. The aquatic habitat in this area is typified by rapidly flowing water with many short pools and well-defined riffles. The stream bottom is composed mainly of fine to coarse chert fragments. During times of flooding, the fragments are washed up into piles forming an unstable pool-riffle pattern. Sand and silt are found on the bottom only in the quieter, deeper pools and backwater areas. Aquatic vegetation in this part of the stream is limited to water cress (Nasturtium officinale) in areas strongly influenced by springs, water willow (Dianthera americana) along the margins of the larger pools and riffles, coontail (Ceratophyllum sp.) and water milfoil (Myriophyllum sp.) along the margins of the larger pools. Species of fish found in this part of the stream typically prefer cool (maximum 83°F) 9/, sediment-free water and include the smallmouth bass, rockbass, northern hogsucker, and several species of darters and minnows. However, warmer microhabitats exist in this portion of the watershed which provide niches for species such as the blackspotted topminnow and green sunfish.

The second major physiographic region included in the Little Black River Watershed is the Southeastern Lowlands. 8/ This region includes all of the lowland ditches and that portion of the main river channel (24 miles of Little Black River) excluded from the two regions previously discussed. Stream flow in this area is more sluggish due to

the low gradient, and in some cases (i.e., the oxbows and sloughs) flow is nonexistent.

Aquatic habitats in this area vary considerably in turbidity, bottom type, aquatic vegetation, and shading by riparian vegetation. Cover in these ditches is often sparse and confined to the ditch margins where flow has undercut roots of shoreline vegetation. Principal bottom type is fine shifting sand with a few localized deposits of small gravel or silt. 8/ The more open areas, not recently dredged or shaded by trees and shrubs, are generally choked with submergent aquatic vegetation of various types, especially coontail, water milfoil and various pondweeds, (Potamogeton sp.). 8/ The oxbows and slough areas are characterized by clear water with seasonal dense growths of aquatic vegetation similar to that found in the quiet pool areas of the ditches.

This entire physiographic region is well supplied with ground water. The deeper areas of the ditches have water depths of 4 to 6 feet and maintain large fish populations. 10/ The typical fish species association in this physiographic region includes largemouth bass, bluegill, bowfin, and European carp.

In the uplands, the rapid stream flow and absence of shallow standing waters limit the mosquito population. In the delta, the sediment and weed choked drainage ditches provide favorable breeding conditions for mosquitoes. Precipitation and floodwaters are trapped in depressions or scour holes and channels, and provide additional breeding places.

This region is subject to heavy cultivation which gives rise to high stream nutrient loads. However, due to the low relief, erosion is minimal and the waters remain clear most of the year, except during periods of flooding.

A transition zone exists between the two major physiographic regions which includes Logan and Harris Creeks and a portion of the Little Black River from the confluence with these creeks, upstream to U.S. Highway 160. This portion is within the Lower Little Black Project and includes 37 miles of perennial flowing stream. The aquatic habitat in this zone is more variable; intergrading from fast flowing, rubble bottom areas in the upper reaches, to a more sluggish sand or silt-clay bottom, in the lower reaches. Aquatic vegetation in this area includes those species previously listed for the Ozark uplands with pond lilies (Nuphar sp.) present in the shallow riffle and pool areas. Additional, scattered stands of bald cypress (Taxodium distichum) and sycamore (Platanus occidentalis) overhang the stream banks and in some cases produce some very excellent fish cover. The overall stream environment in this zone gives the appearance of being a little more stable than that found in the Ozark uplands. The pools and riffles seem to be more stable, with the exception of the upper reaches of Logan and Harris Creeks. Additionally, the water temperature in this zone is

warmer and inorganic turbidity and sedimentation are more prevalent. Fishes found in this area include both warm and cool water species, as well as sediment tolerant and intolerant species. The smallmouth bass-rock bass species association, typical of the Ozark uplands, is found in the cooler, clearer areas influenced by springs and seasonally in other areas of the stream as their temperature tolerances permit. A second species association, including the spotted bass, longear sunfish, and grass pickerel, are more typically found in the lower reaches of this zone. Their tolerances of higher temperatures and increased turbidity are the apparent permitting factors.

The fish fauna of the Little Black River is extremely varied due to the diversity of aquatic habitats. A total of 75 species have been collected from the watershed. A total of 117 species known to occur regionally in adjacent watersheds have also been listed as possibly occurring in the Little Black River. 4/

Of concern is the presence of seven species designated rare or endangered by Missouri. 39/ Two of the seven species listed were included in early Department of Conservation collections on the Little Black Watershed. 8/ These are the harlequin darter and the pugnose minnow. None of the seven were found in recent MRI collections. However, their presence in the watershed is certainly possible.

Data provided by the Missouri Department of Conservation gives a good estimate of standing crops of fishes in the ditches during mid-summer low water levels. 10/ These estimates state that on the average the old heavily vegetated ditches will support approximately 48 pounds per acre of catchable sportfish and 453 pounds per acre of catchable roughfish. Estimates of standing crop for a recently dredged ditch indicate that it supported only 10 pounds per acre of catchable sportfish and 169 pounds per acre of catchable roughfish. Thus, the habitat, enhanced through time provided by the old deeper ditches is influential in nearly tripling the standing crop of catchable fish in proportion to new ditches. Indeed, when adequate depth is available, the old ditches are quite viable in terms of biological production. On the other hand, when mid-summer depths are shallow as shown for the stations on the Harviell ditch, standing crops of fish drop off quite drastically. 4/ In terms of sportfish production, most of the ditches leave something to be desired, at least during the time of the Department of Conservation survey. However, conservation agents and residents of the area report catching many bass and crappie during high water in the spring of the year. 8/

There are no perennially flowing ditches except in the lower 2.1 miles of ditch No. 1. Estimates of permanent pools in drainage ditches (midsummer) include 51.6 acres of water greater than 3.0 feet deep and 36.9 acres of pools less than 3.0 feet deep. The deeper pools along ditch No. 3 include a half-mile section which is

greater than 6 feet deep, and more than a mile that is about 4 feet deep. Additionally, slough area totaling more than 5 acres in size is located at the upper end of ditch No. 3. Another significant pool exists in a lateral of ditch No. 2 which carries overflow from the Little Black River below its confluence with Logan Creek. A large pool in the Brown-Taft ditch system occurs as a slough or scour channel in a lateral just east of where ditch No. 3 begins. These large pools total 29 surface acres.

Several of the deeper pool areas are created by beaver dams. One large dam on ditch No. 1 was estimated to be up to 5 feet deep. ^{4/} A total of 18 acres of pools were attributed to beaver activity. Another source of pool creation was related to sporadic channel cleaning. A portion of the channel would be cleaned and a lower part not cleaned, thus creating a pool in the dredged area. Beaver activity also seemed to increase in these areas where plant succession was set back to a lower order of growth such as willow and American sycamore.

The smaller pools (less than 3.0 feet deep) will not be discussed in detail since they are scattered throughout the drainage system. However, their importance should not be underestimated as they provide excellent nursery areas for young-of-the-year sunfish, suckers, and minnows. ^{8/} (See Appendix F for a display of pools and flow in the drainage ditches.)

Plankton samples were collected from each of the nine sampling stations ^{4/} during April 15-18, 1974. Mean number of plankton for the Upper Little Black River and its tributaries ranged from 27-130 per liter. These counts are so low as to be a negligible consideration in this study. No true or distinctive plankton community exists in the streams because of the limiting factor of current. Those few organisms encountered were derived from headwater ponds, springs, quiet backwaters of streams, or had been dislodged from the bottom or submersed objects. ^{11/} Samples from the lower reaches of the Little Black main stem were not obtained. The two stations sampling the stream transition area would be largely representative of the lower main stem reaches. Mean number of net plankton per liter, for the two transition sections, was 127 and 130 respectively, compared to 27-34 range in the 5 stations of the upper reaches. This would be indicative of a more distinctive plankton situation as expected.

Mean numbers of net plankton for the ditches ranged from 556-706 per liter. This shows a drastic increase over that found in the upper part of the watershed and reflects the greater productivity of ditch habitats. Organisms identified from the samples, however, did not show the diversity found in the uplands.

The ditches, as compared to the uplands, provide a more stable habitat; however, the number of aquatic niches in the form of springs, ponds, etc., is much reduced. This leads to intense interspecific

competition which tends to reduce species diversity. 12/ In simple ecosystems, basic productivity is frequently high but species diversity is low.

Intensive agricultural fertilization in the lowlands is one of the primary causative factors of high production. This leads to occasional nuisance "algal blooms" in the more stagnant areas, and may be partially responsible for the taste problem, expressed by area fishermen, in their midsummer catches.

Samples of stream benthos were collected at each of the nine sampling stations. 4/ A total of 40 taxa of benthic macroinvertebrates were identified from the watershed. 4/ Clifford identified a total of 57 taxa for six Ozark streams. 13/ Considering the larger area involved in Clifford's study, the results shown on the Little Black compare favorably. This is largely due to the diversity of habitats available in this watershed.

The upper portion of the Little Black Watershed lies within the Ozark Plateau zoogeographic region. 14/ The delta area differs from the uplands, not only in physiography, but also in the native wildlife species which inhabit the area.

The Little Black Watershed is within geographic range of 11 species of salamanders and 13 species of frogs and toads. 4/ 15/ The delta area produces a higher standing crop of these animals and should have a greater species diversity than the upland areas. Bullfrogs are abundant in the roadside ditches and sloughs, and are the only species of this group utilized for food and sport by man.

There are no known amphibians which are considered rare or endangered either nationally or by the States of Arkansas or Missouri in this watershed.

The reptiles of this geographical area consist of 6 species of lizards, 15 species of turtles, and 29 species of snakes. 4/ 15/ The large tracts of undeveloped land, the abundance of diverse habitat, and the numerous water areas contribute to high reptilian populations.

In the delta, the populations of turtles would be considerably higher than those found in the uplands. Conversely, lizards would probably be more abundant in the forested uplands. Populations and species diversity of snakes will probably be highest in the areas adjacent to the ditches of the delta and the Little Black River channel.

There are 270 species of birds which possibly occur in the Little Black Watershed. 4/ Of these, 111 are migrants, 37 are winter residents, 68 are summer residents, and 54 are permanent residents. 16/ 17/ Although the watershed is within the Mississippi Flyway, waterfowl use of the watershed is limited. Wood ducks, however, do nest in the area, making use of standing timber adjacent to water courses.

There are 58 species of mammals which possibly occur in the watershed. 4/ 18/ Of these, 13 species are considered furbearers and 5 species are classed as game animals in Missouri. Those classed as furbearers include the opossum, raccoon, badger, longtailed weasel, mink, spotted skunk, striped skunk, coyote, red and gray fox, bobcat, beaver, and muskrat. The game animals are whitetailed deer, swamp rabbit, eastern cottontail, fox and gray squirrel.

Deer, rabbit, quail, and squirrel populations in the uplands are low when compared to state averages. 19/ Quail and rabbit populations in the foothills are considerably higher. Cropland is mixed with woodlands and provides plentiful food and edge areas. The bottom land populations of most wildlife species are highest adjacent to areas of good cover, namely ditch banks. Quail and rabbits are abundant along these banks.

Gray fox, gray squirrel, turkey, and deer are found in the forested uplands, while deer, red fox, cottontail rabbit, and quail are found in the areas more interspersed with crop, pasture, and forest land. Swamp rabbits, as the name implies, would be found in the bottom land areas subject to frequent flooding.

Three species of animals considered rare or endangered nationally which may occur in the watershed are the southern bald eagle, Indiana bat, and eastern cougar. a/ 20/

There are several other species considered rare or endangered by Missouri which may occur in the watershed. 4/ These are listed, along with their status and other remarks in the "Rare and Endangered Species of Missouri." 39/ It should be understood that some species listed as rare or endangered in Missouri or Arkansas may not necessarily be considered so elsewhere, because Missouri or Arkansas may be a peripheral part of their native range. And, since geographical range is controlled by various limits of tolerance, minor changes in habitat may drastically affect species populations.

5. Recreational Resources: In 1970, the Missouri Inter-Agency Council for Outdoor Recreation developed a revised Outdoor Recreation Plan. This plan consisted of an inventory of recreational resources and prediction of recreational needs through the year 1990. The plan divides the state into multi-county regions.

The Little Black River Watershed lies near the center of the south half of the Ozark Foothills Region, comprised of Butler, Ripley,

a/ The Eastern Cougar (Felis concolor cougar) subspecies probably did not occur as a distinct race in Missouri. This part of the state historically is believed to have been an integral area among four races - cougar, coryi, hippolestes, and stanleyana.

Carter, Wayne, and Reynolds Counties. This region contains more recreational land per resident than any other region. Approximately 88 percent of the recreational land in the Ozark Foothills Region is owned or managed by the federal government. Approximately 11 percent is controlled by state agencies. The remainder is in private ownership. This region comprises part of the Ozarks which are major recreational areas. A large part of the recreational resources are used by nonresidents. Access and facilities for outdoor activities on private land are becoming more difficult to obtain. The richness of the soil and high land values in the delta have discouraged large-scale recreational developments in that area.

The Department of Interior, through the National Park Service, is developing a National Scenic Riverway along part of the Current River. This strip-like park includes local points of interest; such as Big Spring near Van Buren, Missouri. Preservation of nature and public use are goals of the riverway.

The Little Black Watershed is a remote scenic area containing qualities valued for outdoor recreation. Large hills, steeply sloping into valleys, provide many panoramic scenes. The river and its tributaries form a scenic and quaint natural Ozark stream. The Little Black River is one of the watershed's major recreational resources. It is a scenic, spring-fed, free-flowing stream which flows rapidly down through the uplands then slows and meanders through the flood plain between tree-lined banks. Similarly, the tributary streams are exceptionally scenic; opportunities exist for fishing, nature study, swimming and wading in the deeper holes, aesthetic enjoyment, and canoeing during the high flows. Spring flowerings, summer greenery, and fall foliage all contribute to the type of natural setting sought for recreational experiences.

Canoe floating provides important access to the streams and has potential to more fully use the recreational and scenic resources. The river and its tributaries are largely bordered by private lands and the limited number of access sites is important. Tables on pages 63 and 64 list recreation areas in or near the Little Black Watershed which are in addition to fishing on the Little Black River and hunting on private lands.

The existing public recreational areas are used extensively. The use of state parks has exceeded capacity in past years, and has led to establishment of a capacity for each park by the Missouri Department of Natural Resources, Division of Parks and Recreation. The National Forests of Missouri, the state forest, and other facilities operated by the Missouri Department of Conservation are open to the public. On private areas, access is by permission of the owner or operator. There is extensive use of upland and flood plain areas on private lands for hunting turkey, quail, and deer.

PRINCIPAL RECREATIONAL AREAS IN OR NEAR

LITTLE BLACK WATERSHED

Page 1

	Acreage		Primary Uses	Managing Agency
	Land	Water ^{a/}		
Within a 25-Mile Radius of Grandin, Mo.				
Ripley Community Lake	90	90	Fishing	Missouri Department of Conservation
Ozark National Scenic Riverway	55,000	Current River access	Fishing, Canoeing, Scenery	National Park Service
Lake Wappapello State Park	41,850	400	Picnicking, Camping, Fishing, Waterfowl Hunting and Observation	Missouri State Park Board & Missouri Department of Conservation
Wappapello Reservoir and Wildlife Area	36,196	7,800	Picnicking, Camping, Fishing, Waterfowl Hunting and Observation	Corps of Engineers
Buffalo Creek Recreational Area	(Mark Twain National Forest)		Camping, Swimming, Picnicking	U.S. Forest Service
Hawes Memorial Recreational Area	(Mark Twain National Forest)		Camping, Picnicking, Swimming, Fishing, Boating	U.S. Forest Service
Doniphan Country Club	NA	NA	Golf, Swimming	Private Club
Poplar Bluff Country Club	NA	NA	Golf, Swimming	Private Club
Within a 50-Mile Radius of Grandin, Mo.				
Missouri				
Duck Creek Wildlife Area	4,195	1,773	Fishing, Hunting	Missouri Department of Conservation
Sam A. Baker State Forest	17,782	-	Hunting	Missouri Department of Conservation
Sam A. Baker State Park	4,858	40	Fishing, Boating, Camping, Cabins	Missouri State Park Board
Deer Run State Forest	102,602	-	Hunting	Missouri Department of Conservation
Peck Ranch Wildlife Refuge	22,565	-	Hunting, Wildlife Production	Missouri Department of Conservation
Eleven Point River Trout Management Area	-	5.5 miles of stream	Fishing	Missouri Department of Conservation
Bradyville Wildlife Area	268	-	Waterfowl Hunting	Missouri Department of Conservation
Mingo Wildlife Management Refuge	21,663	NA	Fishing, Hunting, Nature Observation	U.S. Bureau of Sport Fisheries and Wildlife
Clearwater Reservoir	16,992	1,650	Camping, Fishing, Boating	U.S. Corps of Engineers
Fremont Tower Picnic Ground	3	NA	Picnicking	Private
McCormick Lake Recreational Area (part of Mark Twain National Forest)	15	11	Picnicking, Fishing, Swimming, Boating	U.S. Forest Service

PRINCIPAL RECREATIONAL AREAS IN OR NEAR

LITTLE BLACK WATERSHED

(Cont'd)

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	Acreage		Primary Uses	Managing Agency
	Land	Water ^{a/}		
Within a 50-Mile Radius of Grandin, Mo.				
Missouri (Concluded)				
Clark National Forest, Butler County ^{b/}	46,723	15	Picnicking, Camping, Fishing, Hiking	U.S. Forest Service
Mark Twain National Forest ^{b/}	68,783	96	Picnicking, Camping Fishing, Hiking	U.S. Forest Service
Carter County	88,405	363	Picnicking, Camping Fishing, Hiking	U.S. Forest Service
Ripley County				
Ben Cash Wildlife Area	982	3 miles river access	Hunting, Fishing	Missouri Department of Conservation
Coon Island Access	5	438 ft. of stream	Fishing, Canoeing	Missouri Department of Conservation
Doniphan Towersite	10	-	Picnicking, Fire Control, Hunting	Missouri Department of Conservation
Fish Access	4	stream, 560 ft.	Fishing, Canoeing	Missouri Department of Conservation
Grandin Towersite	160	-	Picnicking, Fire Control, Hunting	Missouri Department of Conservation
Greenville Ford Access	3	stream, 200 ft.	Fishing, Canoeing	Missouri Department of Conservation
Hilliard Access	1	stream, 200 ft.	Fishing, Canoeing	Missouri Department of Conservation
Turkey Pen Tract	160	-	Hunting	Missouri Department of Conservation
Little Black State Forest	2,322	1-1/4 mile of river	Camping, Picnicking, Fishing, Hunting	Missouri Department of Conservation
Lone Hill Towersite	13	-	Picnicking, Fire Control	Missouri Department of Conservation
Poplar Bluff State Forest	950	1/4 mile of river	Camping, Picnicking	Missouri Department of Conservation
Arkansas				
Black River State Wildlife Area	20,000	shallow water	Waterfowl and small Game Hunting	Arkansas Game and Fish Commission
Mammoth Spring State Park	NA	NA	Camping, Picnicking	Arkansas State Park Dept.

^{a/} Acres unless otherwise given.

NA - Not available.

^{b/} Clark National Forest and Mark Twain National Forest are now designated as National Forests of Missouri.

Water-based recreation is limited to streams, the Missouri Department of Conservation community lakes, Clearwater and Wappapello Reservoirs, farm ponds, and private lakes. The river and its tributaries are largely bordered by private lands and the limited number of access sites are important to fishermen and canoeists. Water quality is good during normal flows.

Pollution is present in the Little Black River, but not of sufficient magnitude to create serious problems. Water quality in the Little Black River is good during normal flows, but pesticides and sediment reduce water quality during runoff periods. Water quality of the stream is highest near the headwaters, and deteriorates downstream. The greatest increases of pollutants occur in the delta area. Waters from the drainage ditches which join the Little Black River in Arkansas significantly degrade the water quality of the Little Black River.

6. Archeological and Historic Values and Unique Scenic Areas: Research has revealed that for the past 10,000 years the Little Black River area has been a locus of human activity, but little information is available on the Upper Little Black River Watershed due to lack of intensive survey in that area. Based on knowledge concerning human occupation of the Lower Little Black Watershed, it can be assumed that the cultural resources are as extensive, perhaps more extensive, in the Upper Little Black River Valley.

The director of the Missouri Archeological Survey, the State Historic Preservation Officers, and the state archeologist for the Arkansas Archeological Survey have been consulted regarding archeological sites within the Little Black Watershed. The area covered by the Lower Little Black River Watershed has been intensively surveyed for archeological sites. This work was accomplished over a period of ten years by the Powers Phase Project of the University of Michigan Museum of Anthropology in cooperation with the American Archeology Division of the University of Missouri. Several hundred sites have been located and some extensively excavated. Findings from this research indicate habitation by Mississippian and Archaic cultures. The Mississippian occupation is normally found on the sand ridges of this area, while the Archaic and woodland culture remains occur primarily on the first terrace above the Little Black River channel. Artifacts may be expected to occur from surface level to as deep as 2 meters below the surface. As a result of this research, a district encompassing over 200 archeological and historical sites (the Little Black River Archeological District) has been included in the National Register of Historic Places. This district includes an area of approximately 135 square miles within the Little Black Watersheds. It contains two sites previously enrolled on the National Register of Historic Places (Koehler Fortified Archeological Site located about one mile northeast of Naylor and the Wilborn-Steinberg Site, near the west edge of Neelyville).

From historical documents it is known that there are several historic grist mill sites, a military cemetery, early homesteads, and a historic

road located within the Little Black River Watershed. Early French trappers and traders used the road, called the Nachitoches Path, as early as the first quarter of the 18th century. It subsequently became the route of pioneers settling the Red River area and served as a route for movement of the Cherokee Indians during the Jackson Administration. It became an official military road in 1834 and was the major route of invasion for General Price's army during the Missouri Campaign of the Civil War. It is worth mentioning that the area around Grandin was the scene of an intensive lumber enterprise. 24/ In 1890, Grandin had the largest sawmill in the world at that time. The mill processed 90 railroad cars of logs per day with an annual production of 70 million board feet. 27/ An earlier (1870) sawmill was located on Brushy Creek and owned by Mr. J. B. White.

Mrs. Pennington 24/ has reported on the location of a well-known Indian trail in Carter County between the Current and Black Rivers. Near Van Buren, it follows the north bank of the Current River just below the summit of the ridges. The trail can be seen near the mouth of Six Mile Hollow and again where it ascends Granite Quarry Mountain. Thus, not only was the Little Black River area important in prehistoric times but it played a major role in the growth of the United States during the Westward Expansion.

Sources of information for the historical survey include: "The National Register of Historic Places," 22/ and more recent announcements of designated historic places that have been reported in the Federal Register. 23/ Other sources include county histories, 24/ 25/ 26/ town histories, 27/ and the "Historic Sites Catalogue." 28/ In addition, the Federal Register, 23/ reviewed for more recent information, provided no listings. However, old family graveyards are located in SE 1/4 Sec. 12, T24N, R2E, SW 1/4 Sec. 19, T25N, R4E, and NE 1/4 Sec. 4, T24N, R3E.

During the review of the draft work plans and environmental impact statement, the University of Missouri with Dr. James E. Price, as principal investigator, made a cultural resource assessment of the direct impact areas of the proposed project. 43/ During this survey, 69 prehistoric and 41 historic sites were identified. The historic value of these locations, although difficult to evaluate without extensive research, appears to range from sites of marginal value to those expected to yield important data. The total number of sites identified to date are 110. Of this number, 55 are within the Little Black River Archeological District. The State Historic Preservation Officers of Arkansas and Missouri report that an additional 26 sites appear to be eligible for nomination to the Register.

7. Soil, Water, and Plant Management Status: Proper treatment of much of the land is not being practiced. Many farm units are uneconomical, and committed factors of production are employed inefficiently. The land on which soil, water, and related plant

resources are adequately protected in the watershed as of June 30, 1973 was reported as 74,904 acres. 29/ The acreages of land adequately protected by land use are as follows:

LAND USE	LAND ADEQUATELY PROTECTED
	(Acres)
Forest Land	42,005
Pastureland	10,652
Cropland	15,947
Other	6,300

The uplands are inherently low in fertility and require proper management to fully utilize their potential. Some minor changes in land use are also needed. Although the percent of cropland in the uplands is low, most of it is better suited to other uses.

The bottom land is moderate to high in fertility. Land use is mostly cropland except in areas where severe flood problems exist. These lands need flood protection and drainage. Approximately 84 percent of the bottom land area has a seasonal high water table with some temporary surface ponding in the winter and spring. Land treatment practices needed include drainage mains and laterals, surface field ditches, land smoothing, crop residue management, and an adequate fertility program.

The watershed lies within the Soil and Water Conservation Districts of Butler, Carter, and Ripley Counties, Missouri, and Clay County, Arkansas. These districts have been actively promoting land treatment measures. Landowners in the watershed have signed 792 cooperative agreements with the four soil and water conservation districts. The agreements cover approximately 55 percent of the area. Conservation plans have been developed with 536 cooperators, and approximately 20 percent of the planned practices have been applied. These measures are generally accepted by landowners; however, the land treatment programs need to be accelerated throughout the watershed.

F. Water and Related Land Resource Problems

1. Land and Water Management: Upland land use is primarily pasture and forest land. Many pastures have been overgrazed and are infested with weeds and brush. Much of the pastureland needs renovation and proper management applied. Many upland farms are too small for efficient operations, and limited capital has restricted the ability of the landowners to install needed land treatment measures.

Approximately 59 percent (146,427 acres) of the watershed is in forest cover. Hydrologic condition is adequate on 34 percent of the area. More intensive management is needed on the remaining forest land. This existing condition is due primarily to the lack of management, wildfires, and intentional burning. Individual fires often destroy large areas due to the lack of fire suppression equipment. Public acceptance of the need for fire prevention continues to be a problem as evidenced by the amount of intentional burning that occurs each year.

Much of the existing forest land is poorly managed. The result is a low stocking of poor quality material and undesirable species. Thus the landowners place a low economic value on such areas. Productivity and economic yield should be restored through sound multiple use management practices such as more intensive fire control, approved harvesting techniques, reforestation and open land tree plantings, and more equitable forest land tax laws.

The clearing of forest land in bottom land sites for production of farm crops is a common practice. This practice depletes the forest resource when there is a need for lumber and related forest products. The forest resource also has value for environmental corridors, aesthetic appeal, wildlife habitat, watershed protection, water pollution abatement, and recreation. This is particularly applicable in the delta portion of the project where the remaining scattered blocks of forest land and tree areas along the drainage ditches are the principal areas remaining for wildlife habitat and control of wind erosion.

Flood plain lands are used primarily for cropland, and fertility is generally high. The primary land treatment needs are for diversions, surface field ditches, land smoothing, proper fertilization, and management plans. Frequent flooding, inadequate outlets, and economic conditions have limited the application of needed land treatment in the floodplain and delta areas. The low returns from the frequently flooded lands have made landowners reluctant to invest in conservation practices for long-term gains.

2. Floodwater Damage: Flooding is a major problem in the bottom land along the tributaries and most of the delta area. Floods occur an average of three to four times each year, with 70 percent occurring

during the growing season. Major floods have occurred in 16 of the past 20 years.

Flooding of the delta land is caused by runoff originating in the delta and upland areas. The magnitude of flooding by runoff from the uplands is increased by two physical conditions: (1) the Little Black River channel capacity decreases as it traverses the delta and (2) natural levees have developed along the main channel.

The Little Black River channel as it leaves the upland through the foothills is a stable incised channel with a capacity of approximately 1,800 c.f.s. The rapidly decreasing grade as the river enters the delta reduces this capacity over 50 percent and causes a spilling of flood flows onto the delta area.

The frequent flooding has caused a natural levee to be developed along the main channel. The velocity of the floodwaters in the main channel is capable of carrying a large sediment load. When the floodwater is spilled out onto the broad delta with an immediate decrease in velocity, most of the sediment load is dropped. Over many years it has developed a natural barrier which prevents the floodwater from returning to the natural channel. The river channel has become ineffective in carrying floodwaters because of meandering, deposition, and frequent root wads.

Floodwater travels overland paralleling the Little Black River and inundating much of the delta area. Most of the floodwater, originating from the 195 square mile drainage area north of Missouri Highway V, flows across the flat delta land. The depth of flooding varies with the undulation of land surface. Most of the homes and farmsteads are developed on the higher ridges or knolls and are not subject to serious flooding. Major floods do isolate many of the farmsteads and cause flooding under houses and, in some cases, a few inches of water inside houses built at lower elevations.

The 100-year flood plain inundated by the Little Black River and upland tributaries is estimated to be 31,898 acres in Missouri and 8,356 acres in Arkansas, making a total of 40,254 acres. This area includes 9,334 acres along streams in the upland, and 30,920 acres in the delta.

Three major areas within the upland watershed area are affected by flooding: (1) a long, relatively narrow flood plain of 1,430 acres adjacent to Beaverdam Creek in Butler and Ripley Counties, (2) a wider, flat area of 6,281 acres along Little Black River, extending 30 miles from above the town of Grandin in Carter County through Ripley County to the outlet in Butler County, and (3) short narrow flood plains of 1,623 acres along Buzzard Run, Logan, and Harris Creeks in Ripley County.

In addition to the 40,254-acre flood plain inundated by the Little Black River and its tributaries, 28,274 acres in the delta which depend on drainage ditches for removal of floodwater, are damaged by local runoff and overflow when their outlets are restricted by floodwaters. This makes a total of 68,528 acres with a water problem in the Lower Little Black Watershed.

Most floodwater damage occurs in reaches VI, VIII, IX, and X (designated on project map) where floodwater overtops the bank of the Little Black River and flows over the delta land to the east and south following the natural slope of the land. The grade of the Little Black River; approximately 4 miles northeast of Naylor where it begins leaving the upland, is 1.7 feet per mile. This changes to almost flat about 3 miles northeast of Naylor to below Highway 142, approximately 1 mile northwest of Naylor.

The left bank of the Little Black River has been breached by floodwater at seven or more locations. Three of these breaks are large and are located along the reach of channel with a low gradient. One of the large breaks is located in the northwest quarter of Sec. 36, T23N, R5E, locally known as Gaines Slough. These eroded channels release floodwater through the natural levees along the river banks and cause flooding. Floodwaters flow south through low areas and are intercepted by drainage ditches No. 1, 2, and 3. At two locations the eroded channels are deep enough to carry part of the low flow of the Little Black River. Since these channels are shorter and steeper than the natural Little Black channel, they are likely to become a new channel for the Little Black River unless future flooding through these openings is prevented.

Cane Creek in the eastern part of the watershed at the north edge of Harviell, frequently overflows its banks causing flooding south and west of town. This inundates approximately 3,000 acres.

The most damaging flood of recent years occurred in March 1964 when 10.10 inches of precipitation were recorded at Doniphan, Missouri, over a 3-day period. During the same period Poplar Bluff, Missouri, recorded 7.95 inches. Approximately 31,000 acres were flooded, and highways to Naylor were closed for 4 days. This flood resulted from a storm in excess of 50-year frequency. Other recent storms of major significance occurred in 1965, 1966, and 1969.

A typical 2-year frequency flood took place in May of 1961. Approximately 21,000 acres were flooded causing an estimated \$480,200 in damages.

Damage from flooding occurs primarily in the spring, but also occurs during the growing season and at harvest time. Excessive soil moisture increases cultivation and harvesting costs, decreases crop yields due to delays in planting, and adversely affects the quality of crops.

Values of flood plain lands vary from \$300 to \$600 per acre, depending upon the degree of hazard and inherent fertility. Except for fences, farm roads, and a few isolated farm buildings, there are no significant agricultural improvements or other properties subject to damages.

Flood plain reaches (designated on Appendix B) within the watershed used in these studies and their locations are as follows:

Reach	Location
Ia	North Prong Little Black River Above Structure B-9 Flood Pool.
I & II	Little Black River Between Structure B-9 and Beaverdam Creek Junction.
IIIa	Beaverdam Creek Above Structure A-3 Flood Pool.
III	Beaverdam Creek Between Structure A-3 and Little Black River Junction.
IV & V	Little Black River Between Beaverdam Creek Junction and the Floodway Diversion Structure.
VIa	Buzzard Run Tributary.
VI & VIII	Little Black River from Reach V to Near Arkansas State Line.
VII	Harris and Logan Creek Tributaries.
IX & X	Little Black River from Reach VIII to Current River.

Total direct agricultural and nonagricultural floodwater damages were studied for floods up to and including 100-year frequency. Average annual dollar damages by category are as follows: a/

a/ June 1974

Reach	Crop and Pasture	Sediment & Erosion	Other Agricultural	Non- Agricultural
Ia	7,258	9,619	3,406	775
I	16,142	16,142	5,676	1,295
II	5,846	5,242	2,219	165
IIIa	3,254	22,392	1,651	991
III	6,077	10,109	2,517	1,511
IV	7,033	2,488	1,161	292
V	28,495	-	1,948	521
VIa	5,949	-	52	39
VI	501,679	84,442	5,470	3,353
VII	20,764	7,136	8,346	2,692
VIII	180,283	23,476	593	1,245
IX	41,651	5,993	142	-
X	76,366	13,663	1,690	1,664

Nonagricultural damage includes damage to roads and bridges. Indirect damages; such as interruption of travel, rerouting mail and school buses, losses sustained by businessmen in the trade area, and similar losses, are estimated to be \$115,091 annually. The average annual area flooded totals 33,913 acres.

Floodwater damage to railroads and highways has been quite severe. Several miles of the St. Louis-San Francisco Railroad were washed out in the March 1964 flood, and this railroad was abandoned following the flood. A total of 10.3 miles of state highways (includes 0.4 miles of U.S. Highway 67) are subject to inundation by floodwater when the Little Black River reaches flood stage. In addition to the damage to the roads and bridges, the depth of the floodwater impedes travel on Highway 142 into and out of the town of Naylor and causes damage to the vehicles which must travel through water during these periods. It has been necessary to employ emergency procedures; such as, the use of boats or aircraft, to provide medical aid during flooding periods.

Highway locations and lengths of road damaged by flooding are as follows:

HIGHWAY	LOCATION	MILES
Highway 142	Logan Creek West of Oxly	0.4
Highway 142	Caldwell Creek East of Oxly	0.2
Highway 142	L. Black River & ditch No. 2 North of Naylor	1.5
Highway 142	Between Naylor & Neelyville: Ditch No. 1	0.7
	Ditch No. 3	0.6
	Suder ditch	0.4
Highway W	(South of Naylor) ditch No. 1	0.7
Highway W	(South of Naylor) ditch No. 3	1.2
Highway AA	East from Highway W. Eaton ditch	0.3
Highway H	North of Naylor & Above Highway 142	0.2
Highway H	Southwest of Naylor ditch No. 2	1.0
Highway H	West of Glenn & South	1.7
County Road	West of "H" & Glenn	0.4
Highway N	South of 142 @ Harris Creek	0.4
Federal Highway 67	North of Neelyville & Harviell ditch	0.4
State Highway 158	West of Harviell	0.2
TOTAL		10.30

In addition, many miles of graveled county roads are damaged or made impassable by floodwaters.

Flooding is a direct threat to lives of people living or traveling in the flood plain. Depth, velocity, and lack of warning contribute to this hazardous condition.

Floodwater and inadequate drainage contribute substantially to pollution problems and create a hazard to the health and well-being of the people. Domestic wells are contaminated, and sewage systems are flooded, contributing harmful effluent that spreads with the flood flow. Mosquito and other insect pests are provided breeding conditions and increase tremendously.

Outlets for the Butler County ditches are in Ripley County. Ripley County ditches, in turn, outlet in Clay County, Arkansas. The existing outlets do not have the capacity to carry flood and drainage water. Although some maintenance has been carried out on an intermittent basis, the drainage districts have not carried out an active maintenance program because of the inadequate outlets. The maintenance work performed has resulted in a hit-and-miss pattern of clearing some reaches and leaving other reaches. The reaches cleaned out have pools of water which are held back by the sections not cleaned out. In recent years Emergency Conservation Measure Program funds have been used to clean out short reaches. Other sections of the ditches are choked with sediment and brush and trees growing in the ditch bottoms.

Flooding in lower reaches of Lower Little Black River also occurs from the Current River even without flooding from the Little Black River. This occurs in reaches VIII, IX, and X of Lower Little Black River approximately every third year and inundates about 9,000 acres. Approximately 2,000 acres are flooded by a 2-year frequency storm on the Current River. The Current River breaks out of its banks at two or three places along a section from approximately 1 to 3 miles below the State line. It flows across country in a southeasterly direction where it joins the Little Black River near the Highway 211 bridge at the north side of Success, Arkansas. The Current River has a drainage area of about 2,100 square miles compared to 389 square miles in the combined Little Black Watersheds; therefore, flood peaks on the two streams generally do not coincide.

3. Erosion Damage: Erosion rates for various land uses in the upland area are as follows:

LAND USE	SHEET EROSION (TONS PER ACRE PER YEAR)
Cropland	7.2
Idle Land	4.0
Pastureland	3.0
Forest Land	4.2
Other	4.0
Average Sheet Erosion	4.3

Roadside and other erosion is estimated to yield the equivalent of 1.4 tons of sediment per watershed acre per year. Streambank erosion in the uplands yields the equivalent of 1 ton of sediment per watershed acre per year. The average gross erosion including streambank is 4.6 tons of sediment per acre per year. Flood plain scour is a severe problem. Approximately 6,800 acres of the upland flood plain and delta have received damage to production ranging from 20 to 55 percent. Sheet erosion of the relatively flat delta land is low. Runoff, however, is considerable and is responsible for the ditch bank erosion which is common throughout the area. Floodwater entering the ditches during a floodwater rise or recession also erodes the ditch banks and yields sediment to the ditches. Numerous scour channels depreciate agricultural land, and sheet scour removes the plow layer. Erosion of the watershed soils depreciates their value and reduces their productive capacity. Flood-induced erosion damage retards the installation of agricultural practices; such as, drainage and land shaping, and thus acts as a restraint to efficient and maximum productivity of lands subject to flooding. The average annual erosion damage is estimated at \$52,598.

4. Sediment Damage: Sediment damage is confined principally to agricultural land and drainage channels. Some minor deposition is present on highway surfaces and in road ditches. Deposits on the flood plain along streams above the delta area consist of natural levees and flood plain splays. The typical deposit ranges in size from cobbles to fine sand. On the flat plain of the delta, deposition consists of fine sand, silt, and clay with the principal damage due to flood plain splays and vertical accretion.

Overbank flows increase turbidity and degrade the water resource. Flood damages from sediment-laden water are greater than those from clear-water flooding. Sedimentation is apparent after each flood, and all vegetation, both crop and natural, receive sediment deposited on the plant. Natural levees prevent return flow of water to the stream on receding flood stage and block natural runoff from fields.

Swamping damage is slight. It occurs where water is trapped behind natural levees and in some scoured areas of the flood plain. Sediment is a problem in drainage ditches. It depletes capacity, contributes to shoaling, and induces growth of vegetation because of fertility of deposited sediment.

Sediment deposition damages 15,149 acres of the flood plain. Damage to production ranges up to 30 percent. Accelerated sedimentation reduces the effective capacity of channels, damages uplands, and increases flooding damages. The present yield of sediment from the watershed is estimated to be 172,905 tons annually at the mouth of the Little Black River. The average annual sediment damage is estimated to be \$148,104.

5. Drainage Problems: Approximately 49,440 acres, or 84 percent of the 59,194 acres of the delta soils, have restricted internal drainage. Proper management of this land dictates limited use due to (1) restricted internal drainage, (2) low areas where surface runoff water temporarily collects, and (3) higher sand ridges formed by flood overflows. High water tables in the spring inhibits root development, leaving plants with inadequate root systems during the summer growing season. The restricted internal drainage and flooding affects the tillage operations, planting, choice of crops, harvesting, and the efficient use of labor, equipment, and capital. Crop yields are low due to uneven stands and the reluctance or inability of the individual to develop adequate drainage systems because of frequency of flooding and the unavailability of adequate drainage outlets. Stream gradient in this part of the watershed is very gradual, generally less than 1 foot per mile.

Most of the early delta area drainage projects were constructed during the period 1900 to 1930. Many of these enterprises became insolvent during the 1930's, and the drainage works have lost their

effectiveness as a result of lack of extension and maintenance. In recent years there have been attempts by local interests to construct drainage systems. Generally, these local efforts have not been fully coordinated to insure that the system installed provided maximum benefits for the funds expended. These uncoordinated efforts by individuals tend to partially alleviate the problems in one area while increasing the problems on adjacent farmlands.

One of the major drainage problems is that drainage systems, particularly the major outlets such as ditches 1, 2, and 3, do not have adequate capacities to carry the flow from farm drainage systems. Major drainage ditches which serve as outlets for the lateral systems are characterized by heavy undergrowth and frequent trees in the channel section, accumulations of debris and sediment, and insufficient channel capacity.

The watershed receives an average annual rainfall of about 47 inches with heavy rains occurring at any time of the year. In addition to heavy rainfall, large volumes of water from the uplands flow into the delta. Because of the inadequacy of the existing drainage systems, this water inundates low-lying areas behind stream and drainage ditch banks and remains for long periods of time after the parent streams have returned to their banks.

Soils in the delta area have medium to high fertility. Soils with good internal drainage are generally in land capability class I, or class II because of erosion or droughtiness problem. Soils with restricted internal drainage (84 percent) are generally in land capability subclass IIw or IIIw.

6. Recreation Problems: Many of the recreational areas in the outlying region are managed for the public, but within the watershed boundaries nearly all the forest, water, and open space areas are in private ownership. Access to these areas is generally by permission. In particular, public access to streams is limited to a few points where roads cross the streams; even at these locations access is restricted and inconvenient.

The 1970 Missouri Outdoor Recreation Plan shows a need for additional fishing, hiking, picnicking, and playfield areas for users from Butler, Ripley, and Carter Counties. Population within a 50-mile radius is 75,000.

By 1980, demand is expected to exceed supply for several recreation activities in Butler, Carter, and Ripley Counties. Much of this demand will emanate from Poplar Bluff in Butler County, the largest trade and population center in the region. 4/

While there were no available data on recreation demand for Clay County, Arkansas, in the seven-county region which includes Clay County (designated Northeast Region) demand is estimated to exceed supply for several major recreational activities by 1980. 30/

There are three general observations that can be drawn from data concerning recreational resource problems. The primary need in both the watershed area and the region is for water-based recreation, particularly fishing and swimming opportunities. Two major lakes (Clearwater and Wappapello) are located within 45 minutes to 2 hours driving time. Use of these facilities regularly exceeds capacity, and consideration has been given to limiting the number of recreation users. The National Scenic Riverway on the Current River is also experiencing use-pressures that exceed capacities. Second, hunting (small game, big game, and waterfowl) opportunities are in great demand by area residents. It has been estimated that by 1980, nearly 300,000 acres will be needed for hunting in Butler, Carter, and Ripley Counties alone. An important recreational resource problem is the preservation and enhancement of hunting lands. Finally, the need is increasing for open, scenic areas with facilities for playfields, picnicking, and bicycling. 4/

National Forest Service lands within a 50-mile area of the watershed include approximately 204,000 acres. Expansion of existing facilities and further development of new facilities will be needed to satisfy some of the demand especially for lower developed recreation activities. These will be quite important in satisfying needs for state and national recreation activities. These resources will not fulfill local and regional need, because of increasing state and national demands. National Forest Service facilities also will not be distributed to meet needs of local areas influencing the Little Black area.

Natural streams, forest lands, open access, and scenic landscapes are abundant resources in the project area. Local citizens have identified a need for recognition of these resources and making some of them available for public use.

7. Plant and Animal Problems: Wildlife-carrying capacities of the upland region are limited for some species. Much of the upland region has dense stands of pole-size timber, and interspersions of different vegetative types is not extensive. Overgrazing by domestic livestock detrimentally affects wildlife vegetation. Inherent low soil fertility affects plant diversity and nutritional qualities of forest and mast. Populations of deer and turkey are low by comparison to good conditions in some other parts of the state.

The foothill region supports a good population of upland wildlife which is not fully utilized. Road systems make the region geographically accessible, but a higher density of resident human population limits public usage.

The conversion of forested land in the delta to cropland has greatly reduced the importance of this area's many native species of wildlife.

Changed land use has been continuing since the early 1900's, and all but about 3,000 acres have been cleared. It is not likely that trends will reverse so that the forested area in the delta portion of the watershed will be increased.

The aquatic resources of the Little Black River Watershed are generally diverse. 4/ However, land clearing and poor agricultural practices which followed settlement have led to increased stream turbidity and sedimentation. This in turn has led to a decrease in species diversity by reducing habitat of those species intolerant of sediment and turbidity. These include the pugnose minnow, a lowland species, which is listed as endangered on Missouri's list of rare and endangered species. According to Trautman 31/ the pugnose minnow declines in abundance with increases in turbidity and sedimentation and decreases in aquatic vegetation. Other species in the watershed which might be affected adversely by sediment pollution are the smallmouth bass, rockbass, hornyhead chub, bigeye chub, and orangethroat darter.

Problems strictly associated with the lowlands involve drainage of the swamplands and removal of vegetation. For practical purposes, no natural sloughs and swamps remain in this area. The remaining aquatic habitat is generally associated with manmade drainage ditches. These are rich in aquatic production, but are periodically cleaned and reworked causing disruption of the conditions developed. Generally, no measures are taken to reduce impact of these disruptions.

Availability of stream fishing access is a problem over the entire watershed. Fishermen tend to congregate at all access points. There are approximately 106 miles of perennially flowing stream and 71 miles of ditches recognized in the watershed. Only one public access site is present. Access to most of the larger pools on the ditches is available by permission from private landowners.

Biota of Missouri's delta region is a unique contrast to the rest of the state. Natural conditions have greatly disappeared through reclamation. For this reason, much of the original biota in the area is in a declining status. Several plant or animal species whose habitation is a marsh, swamp, or lowland hardwood have been lost or are in some danger of being lost. There are 9 mammals, 15 birds, 1 amphibian, 3 reptiles, 7 fish, and 18 plant species considered rare or endangered by Missouri. 4/ In most instances, the reduction in populations of these species is due to reduction of habitat. For instance, the swamp rabbit, water turkey, king rail, Swamison's warbler, and Bachman's warbler have been adversely affected by swamp drainage and removal of the original delta forest. The raptorial species which are considered rare or endangered have probably been reduced through the action of cumulative, persistent insecticides rather than through reduction of habitat. Three of the state listed species are considered threatened nationally--the southern bald eagle, Indiana bat, and eastern cougar.

Needs for additional fishing and hunting opportunities for this area are shown by the following comments from the White River Basin Comprehensive Study:

"Future hunting demand can be satisfied only through intensive wildlife management, habitat improvement, and access to the public and privately-owned lands. Public lands acquired in fee-title or by easements for other project and program purposes, and made available for hunting, could satisfy approximately 35 percent and 60 percent of the hunting needs anticipated by 1980 in Arkansas and Missouri, respectively. By 2000 the public lands are expected to furnish 17 percent of the total supply needed in Arkansas. Publicly-owned lands in Missouri could satisfy 28 percent of the hunting demand by 2020. Land-use conversion and loss of high-quality wildlife habitat on private sector lands will reduce the capacity for wildlife production below the level required to satisfy the continued increase in hunting after the year 2000 in Arkansas, and the year 2020 in Missouri. Continued pressure exerted on the wildlife resources beyond these dates will result in lowering the quality of hunting." 32/

8. Water Quality Problems: The water quality of upland streams is high. Pollutant levels increase downstream. Visual comparisons of flow in the Current River, Little Black River, and from the drainage ditches show that turbidity is highest in the ditches, followed by the Little Black River, and lowest in the Current River. A comparison of water quality parameters for the Current River at Doniphan and Little Black River at Naylor show that water quality in the Current River is superior to that of the Little Black River. 4/

	Maximum Temperature	Maximum Fecal Coliform Count/100 Milliliters	DO	Phosphate Milligrams/liter
Little Black River	82.4 ⁰	14,000	4.8	0.200
Current River	68.0 ⁰	620	6.7	0.047

The pH is somewhat higher in the Current River and dissolved nitrates and ammonia nitrogen are much lower. The maximum dissolved solids are about equal, as is total hardness. These data show that water from the Little Black River degrades the quality of the Current River. Dilution by the much larger flow of the Current River significantly reduces the effect of these pollutants.

The only present problem related to water quality in the upper watershed is the high concentration of phosphorus in the watershed streams. Samples taken April 30, 1974, contained concentrations of this nutrient

which exceeded the maximum recommended limit of 0.1 mg/liter. Arkansas water quality standards include the 0.1 mg/liter for phosphorus although Missouri does not. Regardless of standards, the phosphorus level is high, and may add to the rate of eutrophication. Observations of accelerated algal growth have not been made except for eutrophic conditions which sometimes existing in drainage ditches. Concentrations of bacteriological pollutants are generally low in the uplands and meet state standards. Waters of the river and drainage ditches in the delta contain the highest concentrations of bacteriological pollutants. Locations sampled in the delta area contained coliform concentrations exceeding state standards in two of the three sampling periods.

9. Economic and Social: There are 2,116 landowners in the watershed. Of these, 1,135 have holdings classified as farms which average 190 acres in size. The estimated market value of all agricultural crops sold on a per farm basis averages \$4,000 to \$7,000 below the state average for the Missouri counties, and \$5,000 below the state average for Clay County, Arkansas. The trend for the period 1964 to 1969 was to fewer farm owners with larger farms. This trend has probably not changed in more recent years.

Most of the farms are family-oriented units and 90 percent owner-operated. Less than 6 percent of the farms use more than 150 man-days of hired labor each year. Sixty-three percent of the farmers work off the farm on part-time jobs during a portion of the year.

In 1970 the region's unemployment rate was as high as 7.8 percent compared to the U.S. rate of 4.4 percent. 4/ It also has a relatively smaller working age population, a lower labor force participation rate, and a lower payroll per employee in all sectors than the U.S. as a whole. The percent of families with income less than the poverty level in the Little Black River counties was two to three times higher than the nation as a whole.

During 1970 the manufacturing sector accounted for 21.1 percent of the total employment while retail trade, personal and business services, and agriculture made up 20.1, 19.8, and 11.4 percent, respectively. Comparing these to national averages, manufacturing is 4.8 percent lower, retail trade is 4.1 percent higher, personal and business services are 0.8 percent lower, and agricultural-based employment is 7.7 percent higher than the national averages. These data thus suggest that the lack of jobs in the manufacturing trades is the primary factor depressing the employment opportunities in the area. 4/

The financial support for fire and police protection by local government is significantly smaller in the Little Black River region than is provided by the average of local governments in the States of Arkansas or Missouri. The average dollars spent per capita by local

governments for police protection varies from \$4.29 per capita in Butler County to \$1.40 in Carter County, compared to \$12.59 for the average of all local governments in Missouri and \$5.08 in Arkansas. 4/

Similarly, local government finances for fire protection is substantially below the state averages. In Butler County, local governments spend about \$2.22 per capita annually for fire protection, while in Ripley County only \$0.13 per capita is provided. These figures are considerably lower than the average for all communities in Missouri and Arkansas, \$6.43 and \$3.04, respectively. 4/

In summary, this area is economically depressed due to the low income from farming activities, lack of industrial-related employment opportunities, and below average governmental expenditures on public goods and services.

IV. RELATIONSHIP TO LAND USE PLANS, POLICIES, AND CONTROLS

There are no land use plans for Ripley, Carter, or Butler Counties, nor has there ever been a referendum raised for planning or zoning proposals in any of the three counties. 33/ The Little Black River is, however, within the White River Basin on which a Comprehensive River Basin Study has been made. 32/ The present and future problems and the approaches that appear appropriate for their solutions are included in the basin study reports, and the proposed project is generally consistent with these approaches.

The following projections were developed for land use in the White River Basin, based on trends and national requirements for food and fiber. 32/

LAND USE, WHITE RIVER BASIN, 1964, 1980, 2000, and 2020

<u>Land Use</u>	1964	1980	2000	2020
	(Thousand Acres)			
Cropland	4,059	4,315	4,432	4,546
Pasture	2,650	2,743	2,825	2,902
Forest Land	10,770	10,129	9,913	9,698
Other	<u>343</u>	<u>635</u>	<u>652</u>	<u>676</u>
Total	17,822	17,822	17,822	17,822

Five general conclusions on land use policy and development contained in the White River Basin Study which relate to the project area are discussed in the following paragraphs:

1. In the basin study, flood plain management was considered as a means for flood damage reduction in all urban areas subject to flooding. Other methods of flood protection were determined to be better solutions, however, because these methods would prevent agricultural as well as urban losses and provide a higher overall degree of protection.
2. Public recreational use of the Black River and its tributaries could be increased through modest development programs that emphasize road and stream accessibility and camping facilities. Seasonal low flows should be augmented by water releases from upstream reservoirs in time of need. Intensive development of any one area should be discouraged in favor of small, unobtrusive areas that retain and complement as much of the natural beauty as possible.
3. Boating, water skiing, and sailing are severely limited by the shortage of suitable water areas in the Black River area. In this area, priority was given to construction of multiple-purpose reservoirs by 1980.

4. Improvement of existing highways and constructions of additional access roads with overlooks, parking areas, and short sight-seeing trails would contribute to wider usage of this area by tourists as well as residents. A public relations and advertising campaign oriented to the upper Midwestern United States should result in an increased number of visitors to the area, and state-operated "Welcome Stations" located at strategic points and providing information would enhance the visits of tourists.
5. Natural springs, sinks, clear streams, and general physiography combine to present a particularly appealing environment in the northern part of the Black River area. Family boarding accommodations, highly successful in other similar areas of the United States, are few in number in the Black River area. Rural homes located near streams in the highlands would be welcome to the tourist market. In anticipation of increased tourism and general recreational use of the area, additional service-type facilities would be required. Private capital should be made available for such enterprises as the increased need becomes apparent. Civic leaders should become aware of this need and encourage such investments.

V. ENVIRONMENTAL IMPACT

The combined effects of the Little Black Watershed Projects will have a major impact on this rural area. Damage from flooding will be reduced. The planned improvements will increase farm profits, provide agricultural and nonagricultural jobs, stabilize incomes, and improve living conditions in the watershed. These effects, along with other beneficial and adverse effects, are discussed in this section.

A. Conservation Land Treatment

Land treatment on cropland will reduce the rate of runoff, erosion and sedimentation. In the delta area, drainage practices will improve agricultural efficiency. Land treatment planned on the delta cropland will result in more intensive land use. Drainage of seasonally inundated basins and flats will reduce vegetative variety and decrease habitat for most wildlife present. Land treatment will conserve the soil and aid in maintaining optimum moisture conditions. Cropland treatment, which is concentrated in the upland flood plain and delta, will result in less flooding of fields and improve field drainage. During the project period 37,500 acres will be adequately treated.

Land treatment measures on pastureland will increase livestock forage production and create a better balance between needed and used livestock forage. This will make livestock operations more stable, thus having a beneficial economic impact on rural land residents engaged in livestock farming. Installation of ponds will provide more water for livestock and wildlife and fish habitat. Planned treatment on 18,000 acres of pastureland will not lower carrying capacities of present wildlife habitat. Pastures are located on smaller tracts dispersed throughout the wooded uplands.

The forest land treatment program will develop a protective and absorbent cover of litter and humus to reduce runoff erosion, as well as improve other hydrologic conditions. Proper management and added fire protection will increase the productivity of forest land. Forest land to be adequately treated during the project period is 66,130 acres. Forest land to receive additional fire control is 141,302 acres.

Application of planned treatment measures in the forest land includes silviculture, harvest, and fire control operations. It is expected that most native wildlife will benefit. Planned forest land grazing systems or livestock exclusions of forest lands will increase wildlife carrying conditions. Where considerations are given in forest land operations to enhance wildlife needs, wildlife can be enhanced.

Planned land treatment measures will not adversely affect any listed rare or endangered species and improved management of forest lands and native pasturelands could enhance habitat. No project effects are anticipated on the species considered nationally threatened--the southern bald eagle, Indiana bat, and eastern cougar. The southern bald eagle is considered extirpated from the state, and the primary habitat of the Indiana bat is in caves. No occurrence of cougar in the state has been verified for many years.

Land treatment expected to be completed during the project installation period will reduce sediment from watershed sheet erosion on the upland as follows:

Upland Land Use	Without Project tons/acre/year	With Project tons/acre/year
Cropland	7.2	4.0
Idle Land	4.0	a/
Pastureland	3.0	3.0
Forest Land	4.2	3.0
Other	4.0	4.0
Average Sheet Erosion	4.3	3.1

a/ This land use is expected to change to pastureland or forest land.

Streambank erosion will be reduced from 1.0 ton/acre/year to 0.1 ton/acre/year. Sediment from roadsides and other sources will be reduced from 1.4 tons/acre/year to 0.3 ton/acre/year.

Flood plain damages due to sediment and debris deposition will be reduced approximately 85 percent on 15,149 acres. Sediment delivered to the mouth of Little Black will be reduced from 172,955 to 79,730 tons annually, a reduction of 54 percent.

Protection of the soil resource is a long-term necessity for all life systems in the watershed. Control of accelerated soil erosion will protect this watershed resource. Sediment effects on fish in the Little Black River are not a major limitation. Favorable populations exist in spite of the accelerated sediment load. Nevertheless, visual evidence of sediment turbidity is present after large flows and at the confluence of drainage ditches with Little Black River and the Little Black with the Current Rivers. A considerable improvement in water quality and, therefore, conditions for many fish species will result with the sediment reduction. Water quality improvement by reduced sediment turbidity is expected in the drainage ditches of the delta. Where water quantity and cover conditions are preserved and restored, fish conditions will improve.

Land use changes in the past have resulted in clearing of 89 percent of the delta area for cropland and pasture. These changes to more intensive agriculture in the delta lowlands have decreased the habitat for many species. Unless this trend is changed, or critical habitat areas are preserved, little improvement can be assured for many of the affected species.

The installation of accelerated land treatment measures proposed by these projects will have a minimum effect on flooding. Reduction of flood peaks attributed to land treatment is estimated at about 5 percent.

Water quality will improve with the application of land treatment measures and the shift to more pasture and forest land in the uplands. The installation of retarding structures will have considerable effect on the amount of sediment flowing into the Little Black River and other channels. Other stream pollutants will be reduced in approximately the proportion they are associated with the sediment fraction. Reduced sedimentation in spawning beds should increase hatching success of fish eggs; reduced turbidity should increase overall productivity of the aquatic ecosystem; and stabilization of stream banks and substrate should improve fish cover. These effects together with the stabilized stream flows, should increase carrying conditions of the stream fishery.

Major land use changes are not expected. The reduction of sediment in the drainage ditches will reduce ditch maintenance costs and improve water quality. Improvement in water quality will be primarily from the reduction of suspended sediment. Because no major pollution problems presently exist, little effect is anticipated on existing or possible pollutants. The relatively high phosphate concentrations found may become more associated with trapped sediment and thus be reduced, but this is not expected to substantially reduce phosphate concentrations below structures. Installation of basins at the field side of the inlet structure will supplement the structures in trapping additional sediment by slowing the velocity of the water through the excavated basins.

B. Structural Measures

One-hundred and six miles of perennial flow streams are recognized in the watershed. Alteration planned on Little Black River includes a floodway diversion channel at the beginning of the delta area in Missouri, channel work in Arkansas consisting of enlargement of 1.8 miles along the present alignment, and clearing and snagging on approximately 1.3 miles and construction of 24 floodwater retarding structures and one multiple-purpose structure in the upper reaches of the watershed. Twelve miles of the 106 miles will be inundated by proposed structures. The floodway diversion will only effect the stream channel in the immediate area of construction.

It is expected to increase the numbers of recreation users at the recreational access point. Changes caused by the 1.8 miles of enlargement and 1.3 miles of clearing and snagging will remove streambank cover, instream cover, and holes along this part of the stream. Fish and wildlife habitat will be decreased for several years. Streambank cover will be replaced. Reduced peak storm flows, reduced sediment loads, and prolonged stream flow will be the major effects on stream system of the project area.

The proposed reservoir structures will change the status of the Little Black River from a "free flowing" stream to a partially controlled stream. 4/ Flows will become less sporadic and of longer duration, providing a more stable stream environment. These stable conditions may influence stream ecology in several ways. Species unable to tolerate sporadic flows and occasional droughts may increase in numbers as suggested by Paloumpis. 34/ If spawning seasons of these species overlay with those of species currently dominating the ecosystems (e.g., smallmouth bass and rock bass) increased interspecific competition for food may result among the young immediately following dispersal from the nest. Pflieger suggests that this may be a potential factor in the mortality of smallmouth bass fry. 35/ Under these conditions natural recruitment of smallmouth bass could be reduced.

The release ports on structures A-3, B-9, C-7, D-2, and F-11 will discharge 0.8 c.f.s., 0.9 c.f.s., 0.5 c.f.s., 0.2 c.f.s., and 0.4 c.f.s., respectively. All structures with drainage areas larger than 3.0 square miles will be installed with a bottom-water discharge principal spillway. They will insure that release water from these structures maintains or does not exceed stream temperatures of the Little Black River, and will replace evaporation losses. These outlets will be designed to function similarly to those described by Dillon, et al. 36/ In this way, reservoirs on all major intermittently flowing streams (i.e., those flowing in excess of six months out of the year) should prevent abnormal stream temperature rises and low flows on the Upper Little Black River.

Some stream adjustments may occur, in response to changed flow conditions and sediment load. These changes are expected to be localized in short reaches immediately downstream of reservoirs and are not expected to significantly degrade the stream. 4/

Numbers of plankton organisms in the upper watershed are expected to increase due to the water impoundments, resulting in overall increased aquatic productivity. The increased volume of water will produce larger standing crops of fishes in the impoundments than are now found in the streams, however, the species composition of the fishery will change.

Species composition of benthic populations within impoundments are expected to change. Those typically found on depositing substrata

will predominate. 37/ Total numbers of benthic organisms are also expected to increase which will result in an increase of fish food production.

Reservoirs and standing waters will collect phosphates from influent streams and store a portion of these in consolidated sediments. Increased production of algal and aquatic plants may occur in impoundments as a response to these higher phosphate levels. The magnitude of this production is not anticipated to cause a nuisance in any of the reservoirs of this watershed. Most structures have a high watershed drainage area/pool ratio and therefore fairly quick turnover of water and nutrients. This flushing action is considered a management problem for fisheries, therefore, any increased fish production potential offered by increased nutrient inflow may prove desirable.

Site B-9 selected as a multiple-purpose recreation site is not expected to have nuisance algal or plant problems. Though phosphate amounts were higher than desired, it is the only parameter that exceeds recommendations for recreation waters. 42/ Phosphate occurrence in the watershed seems to be from natural sources, and no problems presently exist in the watershed area. Present oxygen demand, turbidity, suspended solids, the nitrogen/phosphorous ratio, and dissolved solids 4/ were well within recommended limits 42/.

Reservoir-type structures will provide 1,368 acres of water. The 25 pools will vary in size from 11 to 298 acres. Average depth of pools will be 8 feet, ranging from 4.5 in E-6 to 12.0 feet in B-3. The pool areas of the 24 single-purpose flood prevention structures will function as sediment storage throughout the life of the project; therefore, this water resource will not be available for the entire 100-year life of the project. Provisions for sediment storage insure that water storage for project purposes will not be infringed upon during the project life. The 298-acre water area provided by the multiple-purpose pool at structure B-9 will be available for the entire project period.

Fish populations in the reservoir sediment pools should be expected to develop similar to those described in Patriarche and Campbell at Clearwater Lake. 38/ Species such as gizzard shad, bluegills, longear sunfish, white crappie, bullheads, and golden redhorse, all of which are either prolific spawners, omnivorous feeders, or both, will dominate during the first few years following impoundments. Spawning beds of the major stream species, particularly those of the smallmouth bass, will be inundated by the impoundments. Populations of these species should not be expected to reach large proportions within the impoundments without proper management. Mitigation features will help provide fish cover and thus increase standing crop of game fishes. The sediment pools will augment the warm water fishery resource of the area. Water fluctuation in flood pools and a high rate of water exchange lowers carrying conditions and management options of the fishery resource. Maintaining balanced populations of desirable species will be the major management problem.

Shallow water areas will be created by 202 acres of the pools which will be less than 2 feet deep. Surrounding this shallow water area will be approximately 62 miles of shoreline. This aquatic "edge" will increase the various species associated with this environs.

The water surface area added to the uplands by construction of reservoirs will provide additional breeding places for mosquitoes. The steep topography will limit the area of shallow water, most favorable as breeding habitat, to the areas at the upper ends of the pools.

The floodway diversion structure and associated levees along the Little Black River will preserve the normal stream flow and natural, scenic, and fishery conditions along 24 miles of natural stream. Without the project, continued breakout of the river during flood stage could in time change the location of the Little Black River from its present course and create a new flow regime down ditch No. 3. The social and geologic adjustments necessitated by this occurrence will be avoided by installation of the project.

Construction of the 24 planned floodwater retarding structures will require 1,266 acres for dams, emergency spillways, and sediment pools. Multiple-purpose structure B-9 including the recreation pool, will require 312 acres. Present land use is 1,193 acres of forest land, 334 acres of cropland, and 51 acres of pastureland. The structures are dispersed throughout or adjacent to the Clarksville, Captina, and Wilderness soil series. Eighty-three percent of this association is oak-hickory forest type. Pool sizes range from 11 to 298 acres, averaging 55 acres. The structures are all more than 1 mile apart. Loss of present habitat conditions because of water inundation of sediment pools is not considered significant. Construction of the reservoir structures and the associated roads will create forest openings, thus creating more edge effects, and diversifying terrestrial wildlife habitat.

The proposed project will be of more consequence to terrestrial species in the delta than to those in the uplands. The most severe damage will result from a significant loss of terrestrial habitat along the ditch banks. Approximately 570 acres of forest land will be lost in the modification of manmade channels. This is a loss of 64 percent of the ditch bank vegetation in the construction areas. Three hundred and eight acres of forest habitat will be preserved or reestablished.

The existing manmade ditches in Naylor Drainage District and Western Clay Drainage District, except ditch No. 3, will be constructed from one side to preserve existing wildlife habitat on the opposite side. This area, amounting to approximately 200 acres, is now mostly forest land. Its preservation will be assured by a special easement clause to preserve a 30-foot wide strip of existing vegetation along these ditches on the side opposite from the construction.

The ditches in Butler County, except for ditch No. 3, will be worked from one side. Existing vegetation on the opposite side will not be cleared for construction. In lieu of a special easement clause to preserve a 30-foot strip of existing vegetation on the opposite side, Butler County Drainage District No. 10 will acquire by fee simple title and/or by 100-year easement, 100 acres of delta land which will be maintained for wildlife use. Approximately 50 acres will be at the diversion structure on Little Black River, and 50 acres will be located in the delta area. Both of these areas will be managed primarily for wildlife. Approximately 5 acres of this area will be used as public access to the Little Black River.

The rebuilt manmade ditches will be changed in appearance; the scenic value afforded by the bottom land hardwoods and brushy growth that has grown up along the ditch banks will be reduced, particularly along ditch No. 3 where both sides will be cleared. The waterways will be more accessible to the public, and with revegetation may eventually regain some aesthetic value. Short-term effects are the reduction of aesthetic values.

Thirty-five animal and 25 plant species known or possibly occurring in the project area are recognized in the State of Missouri as rare, endangered, or declining. Where structural works are to be installed in the delta drainage ditches, adverse effects of some species can be anticipated. No nationally threatened species will be affected.

Modification of drainage ditches will significantly reduce the area of shallow water, and favor fish habitat which, together, will reduce mosquito production in the area.

Proposed modification of manmade ditches will involve 1,530 acres in channels, spoil banks, and adjoining land. Land use of this area is 483 acres cropland, 832 acres forest land, and 215 acres in channels--104 acres of which is water. After project installation, land use of the 1,530 acres will be 280 acres cropland, 718 acres pastureland, 308 acres of forest land, and 224 acres channels--215 acres of which will be water.

Construction of ditch No. 3 will involve approximately 720 acres of land now in channel, old spoil banks, and adjoining land in Butler, Ripley, and Clay Counties. Present land use of this area is approximately 314 acres cropland, 368 acres forest, and 38 acres channel. Thirty-two acres of this is water. After project installation, land use of the ditch No. 3 area is expected to be 280 acres cropland, 157 acres pastureland, 100 acres forest land (woody shrubs planted for wildlife cover), and 183 acres channel. The water area will be 175 acres.

The remaining 810 acres not involved with ditch No. 3 occurs on the rest of the manmade ditches of the project. The following tabulation shows a breakdown of the remaining ditches for each county under present conditions and with project installed.

Land Use	Butler County		Ripley County		Clay County		Totals	
	After		After		After		Present	After
	Present	Proj.	Present	Proj.	Present	Proj.		
Cropland	89	--	60	--	20	--	169	--
Pastureland	--	279	--	228	--	54	--	561
Forest Land	210	100	212	91	42	17	464	208
Ditch Channel <u>a/</u>	90	10	76	29	11	2	177	41
TOTAL	389	389	348	348	73	73	810	810

a/ Ditch channel after project includes only the channel bottom.
The ditch channel under present conditions included a wider area than just channel bottom.

The recreation development at structure B-9 is designed to accommodate 1,763 persons at one time for planned recreational activities of picnicking, boating, camping, playfields, fishing, nature trails, and swimming. The primary recreation season extends from Memorial Day to Labor Day. A total of 63,468 days of recreation-use is estimated for the primary season. An additional 26,532 recreation days will occur during the remainder of the year. This recreation activity will be primarily fishing. Estimated total annual visitation is 90,000 recreation days with an assigned value of \$2.25 per recreation day.

The recreational development at the diversion structure will provide access to the Little Black River. These facilities will provide some of the recreation needs of the area. Access for canoeing and fishing on Little Black River are planned recreational activities. A total of 4,480 annual recreation visits is estimated. Sixty percent of the annual (recreation) usage is during the period from Memorial Day to Labor Day. Maximum attendance on any single day is estimated to be 80 persons. Because of the limited facilities, a value of \$1.00 per recreation day was used in estimating benefits.

The Little Black Watershed Projects will have a major effect on the flood plain of this watershed. Flood peaks, area inundated, and duration of flooding will be reduced after installation of the projects. The projects consisting of structures and channel will provide approximately a 2-year level of protection in the vicinity of the improved channel. Low frequency flooding will continue along the Little Black River in reaches VI, VIII, and IX because of the present restriction in the river channel. The area benefited, the percent reduction in damages, and the average degree of protection that will be obtained from the Little Black Projects from land treatment, floodwater retarding structures, and channel work are listed as follows:

Reach	Area Benefited Acres	Percent Reduction in Damages	Average Reach Pro- tection Recurrence Interval (Year)
Ia	1,495	77	2
I	2,267	96	3
II	780	85	2
IIIa	716	75	1
III	715	97	8
IV	412	92	4
V	1,326	83	2
VIa (upland)	158	21	Less than 1
VI	16,479	90	3
VII (upland)	1,465	85	3
VIII	7,151	83	2
IX	1,800	88	3
X	5,490	75	2
TOTAL ^{a/}	40,254	85	

^{a/} Fifty-two percent of the Little Black Watersheds will be controlled by structures.

Peak flows and depth of flow will be reduced at the lower end of reaches I, V, VII, and VIII by the projects as follows:

Reach	Recurrence Interval	Percent Reduction in Peak Discharge	Reduction in Stage (Feet)
I	100-year	73	4.8
	5-year	65	4.0
	2-year	60	2.6
V	100-year	65	1.9
	5-year	62	1.3
	2-year	61	0.9
VII	100-year	78	3.9
	5-year	70	2.2
	2-year	64	1.9
VIII	100-year	25	3.5
	5-year	18	5.9
	2-year	13	4.8

The effects of the Little Black Watershed Projects at four locations are illustrated on figure 8. The peak flows for present conditions without project and future conditions with project are shown for 2-year, 5-year, 25-year, and 100-year storms based upon a 24-hour storm analysis. The combined capacity of Little Black River and ditches No. 1, 2, and 3 are also shown for two locations.

The effects on damages resulting from floodwater originating from outside the watershed will be as follows: (1) Flood damages in reaches VIII, IX, and X caused by floods overflowing from the Current River will not be reduced by installation of the Little Black Projects. (2) The levee at Harviell will substantially eliminate overland flooding in this watershed by Cane Creek.

Flood plain area flooded by a storm similar to the 1961 flood would be reduced from 21,244 to 1,260 acres with installation of the projects, a reduction of 94 percent. The combined projects will reduce flooding from 31,000 to 20,000 acres for a storm similar to that of March 1964. The 100-year peak discharge at the outlet end of the watershed will be reduced by 28 percent, and the 2-year peak discharge will be reduced 13 percent.

The installation of lateral multiple-purpose channels will result in a reduction in floodwater damages and provide agricultural drainage for land in the remaining portion of the delta area. The construction of these channels will make it possible for landowners to install improved land treatment practices. Flood prevention and drainage may induce additional clearing in the delta and flood plain.

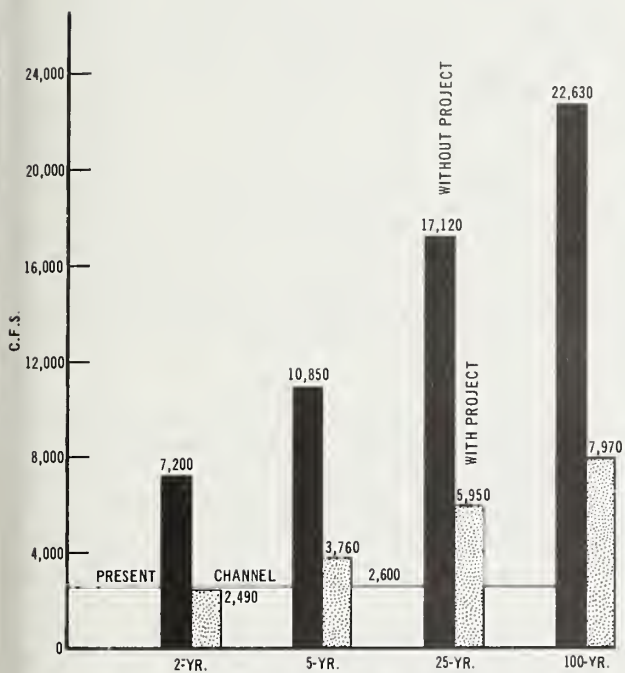
Flood plain lands are used for production of grain crops and hay. Corn, soybeans, and hay are the most important crops grown. Crop yields will increase as a result of reduction of floodwater. More intensive land use and drainage benefits result from reduced production costs, improved crop quality, and increased yields. Timeliness of field work will permit the selection of higher yielding crop varieties and a more efficient weed control program.

Restoration of former productivity or changed land use is not expected to occur in the bottom land area since 89 percent is presently used for production of crops and pasture. Benefits derived from increased production of surplus crops on new lands were not used for economic justification of the project.

The flood damage to highways, bridges, fences, loss of farm equipment and livestock, and debris cleanup will be reduced as a result of installation of the project.

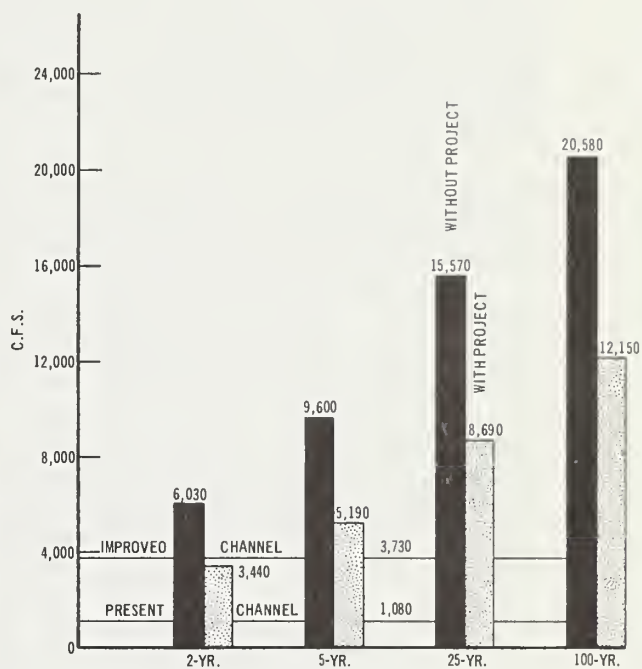
Flood plain use with the project installed will be limited primarily to agriculture. The 2-year level of protection planned in ditch No. 3 for flood flows and the design capacity of the multiple-purpose ditches will not provide adequate protection for specialty crops or

THE PEAK FLOWS FOR PRESENT CONDITIONS (WITHOUT PROJECT) AND FUTURE CONDITIONS (WITH PROJECT) ARE SHOWN FOR 2-YEAR, 5-YEAR, 25-YEAR, AND 100-YEAR STORMS BASED ON A 24-HOUR STORM ANALYSIS. TWO LOCATIONS - CROSS SECTIONS 46 AND 78 - ARE FOR LITTLE BLACK RIVER ALONE, AND TWO - 52 AND 72 - INCLUDE LITTLE BLACK RIVER AND DITCHES 1, 2, AND 3.



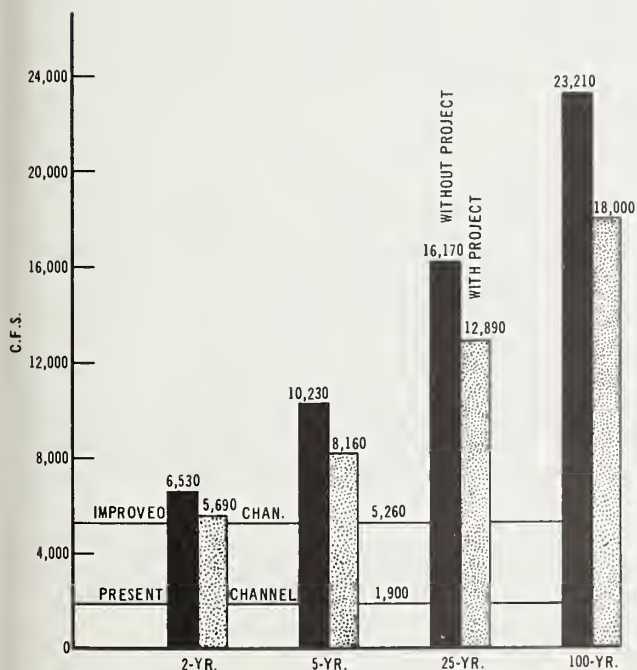
CROSS SECTION NO. 46 - BALL MILL BRIDGE

LOCATION IS APPROXIMATELY 2 MILES BELOW HIGHWAY 160.



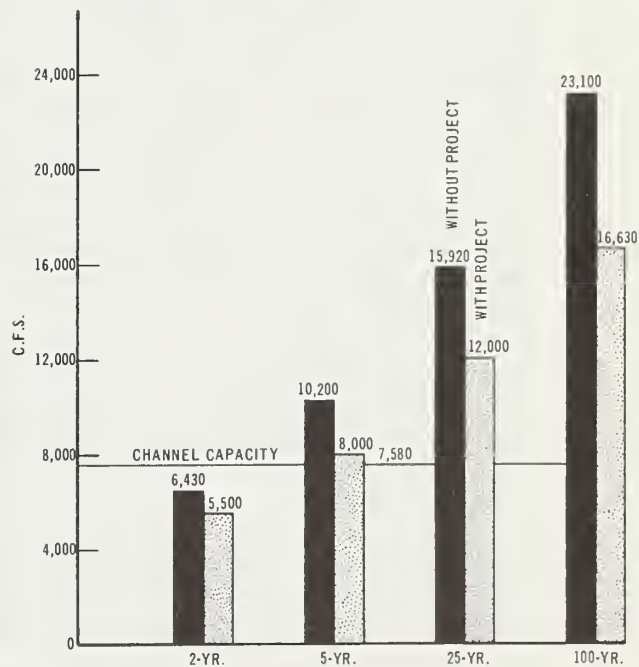
CROSS SECTION NO. 52

NEAR NAYLOR. INCLUDES LITTLE BLACK RIVER APPROXIMATELY 3/4 MILES BELOW HIGHWAY 142 BRIDGE; DITCH NO. 2, 1/4 MILE WEST OF HIGHWAY 142 NORTH OF NAYLOR; DITCH NO. 1, 1/2 MILE NORTH OF HIGHWAY 142, AND DITCH NO. 3, 1/4 MILE NORTH OF HIGHWAY 142.



CROSS SECTION NO. 72 AT STATE LINE

INCLUDES LITTLE BLACK RIVER, DITCHES 1, 2, AND 3 NEAR STATE LINE..



CROSS SECTION NO. 78

TWO MILES SOUTHWEST OF SUCCESS, ARKANSAS. LITTLE BLACK RIVER CHANNEL ONLY AT CONFLUENCE OF LITTLE BLACK RIVER AND BLACK CREEK APPROXIMATELY 2 MILES ABOVE CONFLUENCE OF LITTLE BLACK RIVER WITH CURRENT RIVER.

FIGURE 8

urban use. Farmsteads and other permanent improvements should not be installed in previously flooded areas as major storms will still inundate these areas with the projects installed. The flood prone areas should be zoned to prevent development. A flood hazard analysis will be made for Neelyville and Naylor during project installation. Flooding in Success, Arkansas will not be appreciably changed as flooding is due to overflow from the Current River.

Installation of the project will reduce flood damages on approximately 40,254 acres of bottom land. This includes 9,334 acres on upland tributaries and 30,920 acres of delta land subject to overflow.

During and immediately following construction of floodwater retarding structures and multiple-purpose channels, a hazard of increased erosion and sediment production will exist.

The reduction of average annual crop and pasture flood damage will be 86 percent. Fence damage, debris cleanup, and loss of farm equipment and livestock will be reduced 90 percent. Nonagricultural damages will be reduced 88 percent. This reduction of damages will be primarily to highways and bridges.

The gates incorporated into the design of structures A-3, B-9, C-7, and D-2, will assist in reducing discharges from storms of 5-year frequency magnitude or smaller. When these gates are closed, peak discharges for a 2-year frequency storm will be reduced by approximately 850 c.f.s. at the lower end of reach V.

The installation of floodwater retarding structures in Upper and Lower Little Black Watershed and channel work in Lower Little Black will result in lower peak discharges downstream from the project. The reduced peak flows from the structures counteract the tendency for increased flow from channel improvement. There will be no adverse effects downstream from the project. (See Figure 8).

In addition to the effects in this watershed, the Upper and Lower Little Black Projects will also reduce flood losses downstream. The Comprehensive Basin Study on the White River Basin, Arkansas and Missouri, was published by the White River Coordination Committee in June 1968. This study identifies reduction in damages accruing to the Little Black Projects. These benefits consist of reductions in damages to crops and pasture, fences, roads, bridges, livestock, farm buildings, and indirect losses. They will accrue in the Black Rock, Lockheart Ferry, Newport, Augusta, and Success reaches included in the White River Study.

The combined program of land treatment and structural measures will afford benefits on 68,258 acres of land with an excess water problem which includes approximately 425 operating units. This includes

40,254 acres identified as having flood reduction benefits. For benefit evaluation purposes, approximately 4,524 acres of the remaining 28,274 acres were excluded to reflect the ridges of sandy soil groups. The multiple-purpose channels will provide improved outlets for lateral and field ditches associated with farm drainage systems. Landowners and operators can construct and maintain measures for land treatment with the assurance that excess water will flow off their land. The land treatment measures will be more effective and result in an increase in net farm income. Fertilizers and chemicals will need to be applied at approved rates to avoid raising the nutrient level of waters leaving the watershed thru the drainage ditches, and degrading downstream waters.

Inputs of capital, labor, and management can be more intensively utilized when drainage is improved, and more profitable cropping patterns can also be used. Crops; such as alfalfa which requires well-drained land, can be included in the cropping system. Production costs will decrease through less frequent replanting, fewer trips over the land in seed bed preparation, less expense in weed and grass control, and use of fewer chemicals.

The combined sediment storage in both plans is 10,720 acre feet. The dams in both projects will trap an estimated 138,106 tons of sediment annually.

Damages due to sheet and channel scour will be reduced on 6,804 acres of flood plain and delta land. The reduction in degree of damage will range from 82 to 86 percent. In addition to benefits accruing from controlling annual damage, 440 acres of land can be reclaimed for higher production.

The inlet structures planned along the multiple-purpose ditches will control degrading of field drains and waterways entering into these channels. Installation of the structures will also prevent much of the surface scouring occurring around the entrances of the field drains. These collection ditches and field outlets are expected to trap nutrients and pesticides transported with sediment and reduce future pollutant levels in the drainage ditches.

The relatively high phosphate concentrations found may become more associated with trapped sediment and thus be reduced, but this is not expected to substantially reduce phosphate concentrations in waters downstream of the structures.

The reduction of flood frequency and area will decrease the shallow water habitat available for the breeding of mosquitoes.

Project measures will temporarily flood county roads upstream of structures A-3, B-1, B-9, F-2, F-3, F-11 and will require modification of state highway 21 upstream of structure C-7 and state highway 142 upstream of structure F-3. Dwellings, farm buildings, and hunting cabins will be removed from structure sites A-3, C-7, F-2, F-11 and the floodway. Powerlines will be modified, rerouted or removed at structures A-2, A-3, and F-2. A pipeline in the reservoir area of structure B-9 will be flooded. Old family cemeteries in the flood pools of structures C-7 and A-7 will be modified to prevent flooding. The old family cemetery located in the proposed pool of structure B-9 will need to be moved.

The project installation will affect 69 sites of historical and prehistoric importance. Potentially, 30 risk inundation from sediment pools, nine will be destroyed or covered by dam and spillway construction, 17 will be destroyed by ditch modification, and 10 will be covered with spoil from the ditch modification. Thirty-five of the sites are within the Little Black River Archeological District and 20 appear to be eligible for nomination to the Register. Surveys completed during planning are recognized as significantly adding to knowledge about the cultural resources of the area. Information which may become available during construction will add to the historic and prehistoric knowledge of the area.

C. Economic and Social: Information from the community profile for Ripley County states that the farm-operator family level of living index in 1959 was lower than 81 percent of the 3,135 United States counties. Unemployment and underemployment are persistent problems. The unemployed civilian labor force in Ripley County in 1960 was 7.3 percent, a somewhat higher proportion than the national rate of 5.6 percent. Ranked against the other counties, Ripley County had a higher rate of unemployment than 85 percent of the 3,135 counties in the United States. Eighty percent of all counties in the United States had a higher per capita disposable income than Ripley County in 1966. Since a large part of the watershed is in Ripley County and conditions are similar throughout the area, the census data for the county is considered representative.

Installation of the project will expand the economic base of the rural area. New jobs will be created as a result of the increased production and processing of agricultural products. Improved agricultural efficiency will allow more family farms to stay in business thereby reducing migration to the cities. As a result of stabilizing agriculture and increasing farm profits, the quality of living will be improved and progress will be made toward overall rural development.

Five residences occupied by approximately 24 occupants will be displaced by construction of project measures. This action will not have a major affect on schools, churches, and other neighborhood groups.

There will be some interrupted traffic where flood pools inundate unimproved county roads. In flood plain areas, however,

interruption of travel, mail deliveries, and work delays will be much less a problem with the installation of the project. The project will allow about \$13,000 annually, now spent on roads and bridges, to be used for other priority improvements.

Effects not evaluated in monetary values include: (1) the reduced threat of injury or loss of life that is directly associated with the velocity and depth of floodwaters, (2) hazards to health caused by contamination of wells and pollution from sewage systems, (3) reduced costs of activities that are necessary to control disease-carrying insects and organisms after major floods, and (4) enhanced water quality as a result of land treatment and trapping effect of reservoirs.

The proposed works of improvement will have little effect upon the mineral resources of the watershed. The large regional sand and gravel resource makes it unlikely that it would be necessary to utilize sand and gravel from streams at the proposed structure sites. Because of deep overburden and large nearby supplies, it is doubtful that the stone from the proposed structures will become of economic importance. Clay, iron, and manganese deposits have been noted in Butler County. However, no such deposits were observed near any of the proposed works of improvement.

It has been noted that the delta area has potential for oil and gas exploration. However, the Lower Little Black Watershed is located on shallow sediments at the northern edge of the Embayment, while the oil and gas potential is expected to be greatest, farther south, in the deeper sediments. For this reason, no oil and gas exploration is anticipated in the Lower Little Black Watershed.

D. Favorable Environmental Impacts

1. Erosion and runoff will be controlled on 37,500 acres of cropland, 18,000 acres of pastureland, and 66,130 acres of forest land. Additional fire protection will be provided on 141,302 acres.
2. Water quality of the Little Black River and the drainage ditches will be improved.
3. Changed flow conditions and water quality may benefit some fish species.
4. Drainage and flood prevention benefits will accrue to 59,194 acres of wet land.
5. Irrigation will be more feasible.

6. Archeological information may be discovered during surveys and construction which could add to the knowledge of the history of the area.
7. Storage of floodwaters with subsequent slow release should prolong stream flow at levels equal to or greater than current levels.
8. Shallow water will be created in 202 acres of pools associated with the drop structures along ditch No. 3.
9. Flood prevention will reduce overland flow and reduce the possibility of the Little Black River cutting a new channel in another location.
10. Construction of reservoirs will create additional wildlife habitat.
11. Three hundred and eight acres of forest land will be preserved along ditches.
12. Public access will be provided to drainage ditches and to the Little Black River.
13. An additional 105 acres of water will be created by the ditch modification.
14. Recreation facilities will be provided for 1,848 people at one time, with annual visitation estimated at 94,480 recreation visits.
15. Flood prevention will be provided for 40,254 acres of flood plain and delta land.
16. Peak flow stage will be reduced between 0.9 and 5.9 feet.
17. Less flood damage cleanup will be necessary.
18. The project will reduce losses downstream of the project area.
19. The project dams will improve water quality by storing 10,720 acre feet of sediment.
20. Sediment yield at the mouth of the watershed will be reduced from 172,955 tons to 79,730 tons annually, a reduction of 54 percent.
21. Sheet and channel scour will be reduced on 6,804 acres of flood plain and delta lands.

22. Installation of the projects will expand the economic base of the area.
23. Interruption of mail routes and travel will be decreased.
24. Flood damages to fourteen bridges and 10.3 miles of road will be reduced.
25. The pollution of domestic wells in flooded areas will be decreased.
26. Pools totaling 1,368 acres of surface area will be created. These range from 11 to 298-acre surface areas.
27. Threat of injury or loss of life due to floods will be reduced.
28. Farm profits will be increased, agricultural and nonagricultural jobs will be created, incomes will be stabilized, and living conditions will be improved.

E. Adverse Environmental Impacts

1. Approximately 1.3 miles of the Little Black River in Arkansas will be temporarily disturbed by clearing and snagging.
2. Approximately 12 miles of Little Black stream channel will be inundated by sediment pools of reservoirs.
3. Approximately 1.8 miles of channel enlargement on the Little Black River in Arkansas.
4. Free flowing status of the Little Black River will be changed.
5. Recruitment of smallmouth bass and other riffle species may be reduced.
6. Sediment pools totaling 1,368 acres will slowly fill up during the life of the project.
7. Construction will require 1,578 acres for dams, spillways, and sediment and recreation pools. The present land use is 1,193 acres of forest land, 334 acres of cropland, and 51 acres of pastureland. Sediment and recreation pools will require 1,368 acres. Dams and spillways will require 210 acres.
8. Approximately 570 acres of forest land will be lost during modification of ditches in the delta.

9. Visual aesthetic values along the ditches will be reduced where woody cover is removed.
10. Approximately 205 acres of cropland will be changed to ditch channel or bank.
11. Structural measures may adversely affect some species which are rare, declining, or endangered in Missouri.
12. Additional tourists may introduce litter, noise, exhaust, and traffic into the rural environment.
13. Additional flood prevention and drainage may induce additional clearing in the delta and flood plain.
14. Construction of the projects may induce temporary erosion and sediment production.
15. Land treatment practice measures which reduce plant diversity or the value of wildlife cover and food plants will adversely affect most wildlife present.
16. Project measures will require relocation of five dwellings which include two farm operations; removal of farm buildings, and hunting cabins; removal rerouting or modification of powerlines and a pipeline; modification or moving of old family cemeteries; modification of two state roads, and will temporarily inundate county roads.
17. Some archeological sites will be disturbed or inundated by the project.

VI. ALTERNATIVES

In order to assess alternative actions that might reduce flood damage and avoid adverse environmental effects, 10 primary alternatives with various components of land treatment, flood plain management, and structural measures were evaluated. A "no action" alternative was also considered. These alternatives were analyzed for the following factors: level of protection or recreational development provided; environmental impacts; cost; source of authority for implementation; and flexibility.

Alternatives 1, 2, 3, and 11 would reduce or change the impacts of construction on the environment, but would not achieve the level of benefits reached by the proposed project. Alternatives 4, 5, 6, 7, 8, 9, and 10 would achieve many of the benefits attributed to the selected plan, but contain social or physical features which would severely damage environmental values or were not acceptable to the sponsoring organizations.

Alternative 1: Proposes accelerated land treatment measures with no structural measures. A five percent reduction in average annual flood damages would result. Soil, water, and plant management status would be improved by land treatment on 121,630 acres; 65 percent of the watershed land would be adequately treated. Average annual cropland soil loss would be reduced from 7.2 tons per acre to 4.0 tons per acre. Sheet erosion in the upland would be decreased through conversion of cropland to pasture and forest land, and better management of land. Streambank soil loss would be reduced from 1 ton per acre per year to 0.1 ton per acre per year. Roadside and other losses would be reduced from 1.4 tons per acre per year to 0.3 ton per acre per year. Water quality would be improved by reduced sediment deposition. This alternative could be implemented under P.L. 566 authority with a total initial cost of \$3,543,700.

Alternative 2: Proposes accelerated land treatment and purchase of flowage easements on the 21,188 acres of the flood plain that are damaged by the 2-year frequency flood. Land uses of the flood plain area would become less intensive (low value crops, wildlife uses, etc.). A reduction in flood damages would occur since flood plain values would be reduced. Sheet erosion along with roadside and streambank erosion would be reduced, and water quality improved. Wildlife habitat on 1,500 acres of bottom land hardwoods would be protected for future generations, and 85 miles of fish and wildlife habitat along overgrown ditches would be protected permanently. Landowners could be encouraged to invest in nonagricultural uses of the forest lands bordering ditch channels. For example, picnicking and fishing enterprises could be established with controlled access and a minimum of facilities which could be either removed or

flood proofed for high water periods. Boardwalk trails through bottom land hardwood areas could offer tourist opportunities for wildlife observation in a unique ecosystem. The total initial cost would be \$10,244,000.

Alternative 3: Proposes accelerated land treatment and the purchase in fee title of 21,188 flood plain acres described in Alternative 2, and conversion of this area from agricultural use to green belt, enhancing recreation, wildlife, and aesthetics. Accelerated land treatment will reduce soil loss and improve water quality. Wildlife habitat would be created or improved on 21,188 acres; hunting on this area would provide an estimated 10,000 annual visitor days of recreation. Increased public access to ditch channels would provide 700 additional annual recreation days of fishing. Agricultural production would be foregone on 21,188 acres. The total initial cost would be \$16,945,000.

Alternative 4: Proposes accelerated land treatment and installation of 24 floodwater retarding structures, one multiple-purpose reservoir, and 85 miles of channel. The 24 floodwater retarding structures would be designed to empty both the sediment and retarding pools. The sediment pools of these reservoirs would contain water only during periods of runoff. There would be an 85 percent reduction in average annual flood damages with this alternative. The purchase in fee title on 1,506 acres and flowage easements on an additional 3,869 acres would be necessary. Public recreation opportunities would exist for 90,000 annual visitor days on the 298-acre multiple-purpose reservoir and 1,013 acres of recreational use land. Permanent inundation of 298 acres of agricultural and wildlife habitat land would occur; periodic flooding of 3,869 acres by retarding pools would interrupt these uses. A total of 2.4 miles of perennial stream would be permanently inundated, and 1,880 acres of forest lands would be cleared. The initial cost of this alternative is \$26,686,000.

Alternative 5: Proposes accelerated land treatment and installation of a system of 39 floodwater retarding structures in the uplands, 4.4 miles of levee on the left side of the Little Black River, six levee closures on the Little Black left bank, 61 miles of multiple-purpose channel modifications, and 29.4 miles of channel clearing and snagging on the Little Black River. Average annual flood damage reduction would be 90 percent. Sediment pools would permanently inundate 1,740 acres of agricultural and wildlife habitat land; retarding areas would periodically flood 4,000 additional acres. Clearing of 2,030 acres of forest lands would be necessary. Reservoirs would inundate 12 miles of perennial stream and 1 mile of intermittent stream. Fish and wildlife habitat would be reduced or eliminated along 29 miles of the Little Black River. This alternative was

selected during preliminary project investigation. However, 15 of the floodwater retarding structures were not physically feasible due to land rights problems involving roads, pipelines, and farmsteads. The levee proposed along the left side of the Little Black River would create ownership problems and would require purchase of 23 acres of land. The initial cost of this alternative was estimated to be \$33,130,000.

Alternative 6: Proposes accelerated land treatment and a system of eight large floodwater retarding structures in the uplands on tributaries to the main stem of the Little Black River and 85 miles of multiple-purpose channel modification along the manmade ditches in the delta. An 80 percent reduction in average annual flood damages would result. The sediment pools of these structures would inundate 761 acres of agricultural and wildlife habitat land; retarding pools would periodically flood 2,035 additional acres. The reservoirs would also inundate 12 miles of perennial stream and 1 mile of intermittent stream. Clearing of 818 acres of forest lands would be necessary. Purchase in fee title and flowage easements on 1,775 and 2,390 acres, respectively, would be required. Cool water stream fish species (e.g., smallmouth bass, rockbass) would be largely replaced by warm-water reservoir species (e.g., largemouth bass, bluegill). This alternative could be implemented under P.L.-566 authority at an initial cost of \$18,546,000.

Alternative 7: Proposes accelerated land treatment and extensive channel modification with no floodwater retarding structures. An 86 percent reduction in average annual flood damages would be achieved. Flow would be divided at the diversion structure between the Little Black River and the system of ditches; the river channel would be enlarged, and the ditches would be modified according to the proposed plan. A total of 24 miles of perennial stream on the Little Black River would be modified; 85 miles of ditches would be cleared, deepened, and snagged. A total of 520 acres of forest land and 26 acres of cropland would be lost along the stream banks. The loss of recreational stream fishing, canoeing, and float fishing that would occur is estimated at 3,840 annual recreation visits. This alternate would increase peak flows and induce flood damages in the Little Black-Current River flood plains in Arkansas. The aesthetic quality of the Little Black River would be largely lost. The initial cost would be approximately \$23,986,000.

Alternative 8: Proposes accelerated land treatment and 24 floodwater retarding structures, the multiple-purpose reservoir, and a new system of floodway canals in the delta to carry those flood waters diverted into the floodway channel. An 86 percent reduction in average annual flood damages would result. Sediment pools of the floodwater retarding structures and multiple-purpose reservoir would permanently inundate 1,368 acres of agricultural and wildlife habitat land; 2,800 additional acres would be temporarily flooded in the retarding areas. Clearing of 1,480 acres would be necessary. Also

flooded would be 12 miles of perennial streams and 1 mile of intermittent streams. Installation of the additional ditches would require purchase of 1,160 acres of private land, nearly all of which would be lost to agricultural use. Additional manmade ditches would drain the existing ditches, unless provisions would be made for their preservation. The initial cost would be \$26,394,000.

Alternative 9: Proposes accelerated land treatment and 25 single-purpose floodwater retarding structures in the uplands and straightening the Little Black River to carry a 5-year frequency flow from the point that it enters the delta flood plain (Sec. 24, T23N, R4E) to the Current River. There would be a 90 percent reduction in average annual flood damages. The retarding structures would inundate 1,226 acres of agricultural and wildlife habitat land due to sediment pools; retarding pools would periodically inundate 2,900 additional acres. Clearing of 1,880 acres of forest land would be necessary. Approximately 18 miles of new channel would be constructed, and 24 miles of the Little Black River channel and existing fish and wildlife habitat would be destroyed. This would represent a loss of the aesthetic value of the river as well as approximately 3,840 annual recreation visits, including canoeists and stream fishermen. In addition, 12 miles of perennial stream and 1 mile of intermittent stream channel would be flooded by the retarding structures. Channel construction would require that nine bridges be either rebuilt or have extensions installed. An estimated 4.6 million cubic yards of excavation would be necessary. This alternative would create numerous ownership problems along the new channel, because present land ownerships are to the center of the existing channel in many cases. The initial cost of this alternative is approximately \$22,022,000.

Alternative 10: Proposes accelerated land treatment and 25 single-purpose floodwater retarding structures in the uplands with a diversion at Gaines Slough (Sec. 36, T23N, R4E), enlargement of ditch No. 3 along its present alignment to the State line and the junction with ditch No. 1, alignment of ditch No. 1 to the Little Black River, and straightening the Little Black River from the Current River to the junction of ditch No. 2 just above the State line. This alternative would divert the 5-year frequency flow from the Little Black River to ditch No. 3. Channel modifications would require bottom widths ranging from 80 feet at the lower end to 40 feet at the upper end and depths ranging from 18 to 12 feet. With this depth, the channel bottoms would be in the sand strata and would have stability problems. Clearing of 2,280 acres of forest land would be necessary. Ten bridges would need to be extended or rebuilt, and 5.3 million cubic yards of excavation would be needed. About 10 miles of the existing Little Black River and its habitat would be destroyed which would be a significant loss of aesthetic value and 1,600 annual recreation visits. In addition, some land

rights problems would occur (similar to Alternative 9). The initial cost of this alternative is approximately \$23,680,000.

Alternative 11: Proposes no action. The land treatment program would continue without acceleration, and there would be a 2 percent reduction in average annual flood damages. Soil, water, and plant management status would be improved on 45,000 acres. Significant changes in land use trends would not be anticipated. The present rate of clearing of bottom land hardwoods would be expected to continue. Local landowners would probably go ahead with drainage ditch renovation with no provision for saving any fish and wildlife habitat; the resulting effects would be very damaging to these resources. The needs for additional recreation facilities would not be met. The initial cost of the nonaccelerated land treatment measures would be \$2,232,500. The net annual benefits foregone by not implementing the project would be \$899,066.

VII. SHORT-TERM vs. LONG-TERM USE OF RESOURCES

The major trend in land use changes in the Little Black Watershed has been the clearing of the bottom land hardwood forests. As mentioned previously, only 15 percent remains of the original forested area of the lowland delta. The long-term significance of this trend is that it is occurring not just in the Little Black Watershed, but throughout the White River Basin. In 1960 the estimated acreages of bottom land hardwoods of the White River Basin was 2,222,000 acres. Projected estimates for 2020 are 1,275,000 acres or a loss of 947,000 acres (43%). ^{32/} A similar or accelerated trend is expected in the lowland areas of the Little Black Watershed.

In the development of the Comprehensive Basin Study for the White River Basin, a major tributary reservoir was considered at Fairdealing, Missouri. This reservoir would inundate agricultural areas, provide no protection for areas upstream, and be in conflict with an upstream watershed project. After detailed analysis and meetings with the local interests, this reservoir was eliminated from the 10-15 year plan. The reservoir was retained in the long range plan as an alternate in the event that a watershed project was not developed. This arrangement resulted from joint studies by the Corps of Engineers and the Soil Conservation Service.

The White River Basin Study reported that the Soil Conservation Service had nine P.L.-566 Watershed Protection and Flood Prevention Projects presently existing or under construction. These projects consist primarily of floodwater retarding structures, drainage facilities, and associated land treatment measures. When completed, these projects will have 56 floodwater retarding structures, 460.1 miles of channel improvement, and one multiple-purpose reservoir. The total watershed area for these projects is 560,000 acres, or approximately 875 square miles. In addition, this basin study cites 50 potential P.L.-566 projects involving 849 floodwater retarding structures, including 36 multiple-purpose structures. In ten of these watersheds there would also be a total of 968 miles of multiple-purpose flood prevention and agricultural water management channels and six miles of single-purpose flood control channels. In addition, 2,543 miles of multiple-purpose channels were planned in 29 other watersheds. Total storage of the 849 structures included in the 10 to 15-year plan would be 1,333,685 acre feet. Storage by purposes would be as follows: 1,073,763 acre feet for floodwater detention; 194,086 acre feet for sediment; 9,663 acre feet for municipal and industrial water supply; 6,133 acre feet for irrigation; 6,855 acre feet for water quality control; 37,578 acre feet for recreation; and 5,577 acre feet for fish and wildlife. ^{32/}

According to the White River Comprehensive Basin Study the small watershed projects by the Soil Conservation Service will result in

losses of wildlife habitat through inundation of 21,501 acres and land-use conversions expected as a result of the flood control and drainage project proposals. Hunter-day losses of upland game-hunting attributed to the 21,501 acre inundated area is 5,500 man days unless losses are mitigated. Hunter days available for year 2020 is expected to be 1,948,000 in the basin, a reduction of 67,000 from the 1980 estimated available supply. Waterfowl hunting benefits amounting to 427 man days are assigned to small watershed projects. 32/

Total recreation supply anticipated by small watershed programs in White River Basin is 790,000 recreation days by 2020. 32/

Wildlife habitat losses are not expected in the Little Black projects because of the inundated areas. Mitigation efforts are directed to effects of the channel reconstruction in the lowland area. These mitigation efforts will lessen effects of project measures and provide protection to Fish and Wildlife values of future effects occurring without project efforts.

There are several possible effects of these projects outside the watershed area. The basin report estimates a 26 percent population increase from 1980 to 2000; total basin population in 2000 would be approximately 1,908,000 persons. 32/ The Little Black River Watershed projects would help meet the basin's increased recreation needs. Secondly, the passage of goods through the watershed would be more efficient due to flood protection afforded rail and highway facilities. Finally, the sediment yield contributed by the Little Black River to downstream waterways would be reduced.

The Little Black River Watershed projects will reduce options for long-term uses on the areas incorporated into dams, spillways, sediment pools, retarding areas, the multiple-purpose reservoir, diversion structure, floodway, multiple-purpose channels, channel enlargement areas, levees, and recreation development structures. Present uses of these areas are described in the section entitled "Irreversible and Irretrievable Commitments of Resources."

By reducing erosion, flooding, and sedimentation, and by improving land management practices on agricultural lands and forest lands, the soil productivity of the watershed will be preserved and improved for future generations. The proposed project will also help stabilize the economy of the area.

The structural measures of these projects are expected to continue to provide some flood prevention and sediment control after the end of their assigned life if hydrological conditions are not substantially altered.

VIII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Agricultural use, forest lands, and wildlife habitat will be lost on 1,368 acres to be inundated by sediment and recreation pools of the floodwater retarding structures. An additional 2,948 acres in the retarding areas of the reservoir structure will be periodically flooded, and wildlife and agricultural uses will be greatly reduced. The earth fills and spillways of these structures will occupy an additional 210 acres; these acres are mostly forest land and will be cleared. However, some revegetation will be established following construction.

There will be approximately 12 miles of perennial stream and 4.5 miles of intermittent streams inundated by the proposed floodwater retarding structures. These are major resource commitments, as described in the White River Basin Comprehensive Study:

"Stream resources present two major alternatives. A stream may be allowed to remain in its natural condition or it may be impounded. However, it must be recognized that once a stream is impounded, this resource characteristic is lost. That development process is irreversible whereas a reservoir will remain as an alternative to a free flowing stream." 32/

In addition, while the loss in stream fishing may seem insignificant in relation to the gain in reservoir fishing provided, stream fishing is irreplaceable and in short supply. Stream fish which will not live in impoundments will be lost in those stream reaches inundated by reservoirs. "Future demand for fishing on Ozark streams cannot be sufficiently satisfied beyond 1980 because of the limited supply and irreplaceable nature of this type of habitat." 32/ The structural measures will also change the free flowing status of the stream and may adversely affect some stream species. The proposed channel modifications will further affect some 80 miles of ditches which, though manmade, have developed over time into valuable fishery habitat.

Present uses of the lands to be committed to structural measures are shown in Table 4.

A total of 1,762 acres of forest lands will be permanently lost to the watershed. The significance of this resource was described in the preceeding section.

Construction of the P.L. 566 structures will require 800 to 1,000 man-years of new employment. Operation and maintenance of the structures and recreation facilities will require 250 to 600 man-years of employment. Total project installation cost will

IRRETRIEVABLE COMMITMENTS OF RESOURCES AND LAND USE CONVERSIONS

Structural Measures	Forest Land (acres)		Cropland (acres)		Pastureland (acres)		Other (acres)		Total (acres)		Streams Perennial (miles)		Streams Intermittent (miles)	
	Present	After Project	Present	After Project	Present	After Project	Present	After Project	Present	After Project	Present	After Project	Present	After Project
Floodwater Retarding Structures Sediment and Recreation Pools Earth Fills and Spillways Retarding Pools	1,013		317		38		-		1,368		12.0		4.5	
	179		17		13		1		210		-		-	
	2,592		318		38		0		2,948		9.2		7.0	
Subtotal	3,784		652		89		1		4,526		21.2		11.5	
Channels	Forest Land (acres)		Cropland (acres)		Pastureland (acres)		Other (channel) (acres)							
	Present	After Project	Present	After Project	Present	After Project	Present	After Project	Present	After Project	Present	After Project	Present	After Project
Modification of Ditch No. 3	368	100 ^{a/}	314	280	0	157	38(32) ^{b/}	183(175)			2.1		35	
Modification of Ditches 1 and 2 and all other laterals ^{c/}	464	208	169	0	0	561	177(72)	41(40)						
Floodway	27	0	19	13	0	0	0	33 ^{d/}						
Enlargement of 1.4 miles Little Black River and clearing and snagging of 1.3 miles of Little Black River	34	15	76	76	0	0	26(26)	45(45)			2.7		0	
Subtotal	1,712	893	574	369	0	718	241(130)	302(260)			4.8		35	

^{a/} Woody shrubs planted for wildlife cover.

^{b/} Numbers in parenthesis denote water acres.

^{c/} Additional 100 acres will be acquired for wildlife mitigation. Two acres will be used for recreational development and access to Little Black River, 14 will be used for construction of diversion, and remainder will be left in a natural condition.

^{d/} 1.3 miles of new channel.

be \$27,048,592. The manpower, fuel, materials and funds for construction of the project will be irretrievably committed to the project. These resources will not be available for other projects.

Historical and prehistoric sites damaged or destroyed by project installation will be irretrievably lost. Coordination and cooperation with concerned agencies and groups will insure that damages will be minimized.

IX. CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

From 1961 to 1964 the Soil and Water Conservation District of Ripley County, Missouri, promoted a series of interest meetings to discuss the potential of a P.L. 566 project on the Little Black River. These were held at the following schools within the watershed: Grandin, Missouri; Pine Valley, Missouri; Fairview, Missouri; Spell, Missouri; Naylor, Missouri; and Success, Arkansas.

Early in 1964, the P.L. 566 application was submitted to the Governor of Missouri. Sponsors included the Carter County Court; Ripley County Court; Butler County Court; Butler County Drainage District No. 10; and Soil and Water Conservation District Boards of Ripley County, Carter County, and Butler County, Missouri. The Governor approved the application on June 30, 1964.

The following groups also endorsed the project: Van Buren Lions Club; Van Buren Chamber of Commerce; East Carter County Chamber of Commerce; Doniphan Lions Club; Van Buren Rotary Club; City of Grandin; Ripley County Chamber of Commerce; Doniphan Kiwanis Club; City of Doniphan; Ripley County Farm Bureau; City of Naylor; Clay County Soil and Water Conservation District; Butler County Farm Bureau; Naylor Special Road District; and Poplar Bluff Chamber of Commerce.

A watershed subdistrict was organized for the Missouri portion of the Little Black drainage area in 1964 and has provided leadership in the development of the watershed work plan. The delta area in Ripley County organized a Circuit Court Drainage District in 1968. Clay County Soil and Water Conservation District and Western Clay Drainage District submitted a separate application in August 1964 on the portion of Little Black in Arkansas. The sponsors requested that applications be combined and planned concurrently.

A preliminary investigation was prepared in 1965 and presented to the sponsors on July 26, 1965. The sponsors showed strong interest and requested the Soil Conservation Service to proceed with developing a watershed work plan. Planning authorization was granted in February 1966, by the Administrator of the Soil Conservation Service.

The watershed planning staff gathered field data on various alternatives to meet the goals and objectives of the sponsors. A series of meetings were held with the sponsors and interested public to discuss the field data and various alternatives for formulating land treatment and structural programs to solve their soil and water problems.

Between April 1966, and January 1974, 29 meetings were held with the public, the sponsors, the Missouri Department of Conservation, the Arkansas State Game and Fish Commission, and the Corps of Engineers and other affected state agencies including the Missouri State Highway Commission. These meetings included tours and field trips to discuss, on-site, the various alternatives and designs proposed for the plan.

The National Register of Historic Places, the Arkansas and Missouri Archeological Surveys, the State Historic Preservation Officers, the National Park Service Midwest Archeological Center, and the Advisory Council on Historic Preservation have been consulted regarding the cultural resources within the project area. Early reports suggested that little survey work had been done in the area, and that some important properties had been located. They reported that surveys of direct impact areas were needed. The University of Missouri was engaged to make the required surveys and assess the significance of the sites located. The resulting report, "An Assessment of the Cultural Resources of the Little Black Watershed", has been furnished to the agencies and groups mentioned above. Close coordination with the State Historic Preservation Officers and the University of Missouri Archeologist during planning resulted in modification of project plans to avoid impact to significant sites and to detail the types of impact expected on other sites. The State Historic Preservation Officers were consulted for their opinions about the significance of sites and nature of project induced effects. All information has been submitted to the National Park Service and the Advisory Council on Historic Preservation for compliance with EO 11593, section 106 of PL 89-665 and 36 CFR 800, Procedures for the Protection of Historic and Cultural Properties. The concerned agencies and groups are expected to continue to give counsel and cooperate to fulfill the requirements of appropriate laws. In every meeting, tour, or field trip, opportunity was offered for individuals or groups to raise issues or provide inputs. Numerous newspaper articles and radio broadcasts were used to discuss the project and provide information about the progress of plan development.

The Little Black Watershed is located in the White River Basin. The works of improvement planned are included as a part of the comprehensive Type II study of needed improvements for the White River Basin. The drainage area controlled and acre feet of flood storage provided by Upper and Lower Little Black Watershed Work Plans are essentially the same as that used in the evaluations for the White River Type II Study.

The Corps of Engineers have proposed tie back levees along the Current and Little Black Rivers in the 10 to 15-year plan of the Type II study which would complement this project. No activities are under way to implement authorization of the levees.

No other proposed projects of state or federal agencies will be affected by the works of improvement proposed in the Little Black Work Plans.

Written Comments were requested from the following agencies:

Department of the Army
Department of Commerce
Department of Health, Education, and Welfare
Department of the Interior
Office of Equal Opportunity
Department of Transportation
Environmental Protection Agency
Advisory Council on Historic Preservation
State Historic Preservation Officer
Federal Power Commission
Governor of Missouri
Governor of Arkansas
Missouri Office of Administration, Division of State Planning and Analysis
Ozark Foothills Regional Planning Commission
Water Resources Council
Natural Resources Defense Council
Friends of the Earth
Environmental Defense Fund
National Wildlife Federation
National Audubon Society
Environmental Impact Assessment Project
Ozarks Regional Commission
Arkansas Department of Planning
East Arkansas Planning and Development District

Responses were received from the following agencies:

Department of the Army
Department of Health, Education, and Welfare
Department of the Interior
Department of Transportation
Environmental Protection Agency
Advisory Council on Historic Preservation
State Historic Preservation Officers
Governor of Missouri
Governor of Arkansas (Department of Commerce, Division of Soil and Water Resources)
Missouri Office of Administration, Division of State Planning and Analysis
Ozark Foothills Regional Planning Commission
Arkansas Department of Planning
East Arkansas Planning and Development District
The Wildlife Society, Missouri Chapter

RESPONSES TO COMMENTS RECEIVED

DEPARTMENT OF THE ARMY

Comment: 1. Lower Little Black Watershed Work Plan

Detailed overflow area maps with and without the project in place, similar in style to Figure 7, should be supplied to allow local government and the local populace to better plan for the future of the area. This map should also contain information to determine the elevation and depth of water. This is especially important in the vicinity of small towns such as Success, Naylor and Neelyville. Less populated areas as well as agricultural areas will find the data useful in construction of structural improvements.

Response: This report is being prepared under the Phase-In standards of Principles and Standards. The report was incorporated prior to October 25, 1973. The major purpose of the project was identified as reduction of flood damages on agricultural land. Some scattered residences and incorporated areas are subject to shallow flooding by major storms. The large majority of residences are located on the high sandy ridges which are not subject to flooding. It is common knowledge in the area that all the low lying areas are subject to frequent flooding and, therefore, are poor residential sites. The flooding in Neelyville is strictly from local runoff within the delta area. The flooding is primarily a storm sewer type problem from local ponding. Naylor is primarily on a high sandy ridge with very little flooding without project and would probably be protected with project. Success, Arkansas is primarily flooded from the Current River and since the peaks on the Current River arrive later than those of the Little Black River, flooding is not expected to change appreciably. Additional information has been added to page 94 of the environmental impact statement.

Comment: 2. Analysis based on Section 73, P.L. 93-251 should be included.

Response: A non structural alternative, No. 3, page 103 was considered.

Comment: 3. Page 95 and 121 - The benefits listed on these pages differ in amount.

Response: This difference has been reconciled.

Comment: 4. Upper Little Black Watershed Plan lacks detailed over-flow maps (see preceding comment).

Response: The project map identifies the 100-year flood plain without project and is shown as the area benefited. The project will reduce the area subject to the 100-year flooding. The area as delineated should not be developed for residential sites.

Comment: 5. Draft Environmental Impact Statement

Page 3 - A list of alternatives considered includes many alternatives not discussed in the watershed work plan. No explanation is given for the selection or non-selection of these alternatives.

Response: The Soil Conservation Service Guidelines for preparation of environmental impact statements FR Vol. 39, No. 107, June 3, 1974, page 19659, Item VI Alternatives, specify that "Justification statements for the nonselection of an alternative should not be included..."

DEPARTMENT OF HEALTH, EDUCATION AND WELFARE

Comment: 1. Pages 46-47, 77-78, and 94 contain considerable demographic information relative to the area affected by the proposed project. However, the total number of people displaced by this project is not given.

Response: Additional information has been added to paragraph 5, page 97 to display this effect.

Comment: 2. Page 31, item 3, "Operation and Maintenance", indicates that landowners will be "encouraged" to perform the needed maintenance for land treatment measures. From the standpoint of public health, will "encouragement" for maintenance prove sufficient for insect control?

Response: The land treatment program is a voluntary landowner initiated action. If vector problems arise due to inadequate operation or maintenance of land treatment measures, it is expected that agencies responsible for public health will take appropriate action.

Comment: 3. Page 32 speaks to the "multiple purpose structure B-9 and associated recreational facilities," in addition to maintenance for reservoir structures, but does not indicate vector control procedures on public lands.

Response: Department of Natural Resources, Division of Parks and Recreation will be responsible for maintenance measures needed for future control on their land as identified on page 33.

Comment: 4. Page 33 indicates that operation and maintenance costs will be borne by responsible drainage districts and will include "mowing slopes and ferns along channels for control of undesirable species." Does this include insect and mosquito control?

Response: The modification of ditches will provide deeper water than at present and will promote the use of these pools by fish. The additional fish population together with the reduction in area and frequency of flooding is expected to result in decreased populations of mosquitos after construction. This information has been added to pages 90 and 96.

DEPARTMENT OF THE INTERIOR

Comment: 1. From an outdoor recreation viewpoint the possibility of using more of the floodwater retarding structures for recreation should be fully explored. We notice several are close to the town of Doniphan, and their potential development for recreation purposes could be warranted.

Response: We agree that the potential for recreation development in this area is great. Throughout planning, the opportunities for recreation development were discussed with sponsors, local people and state agencies. The developments planned represent the only recreation areas for which sponsors could be identified.

Comment: 2. The Little Black River appears to have considerable recreation potential. The project sponsors should consider acquiring more access areas to the river, particularly where highways cross. By doing this, access nodes could be provided for entry and exit from the river banks. Recreation developments could be provided at these access nodes.

Response: The sponsors have identified two public access points to the river as a part of their plans. If the need for additional access points arise, numerous local and state concerns could sponsor these additional developments.

Comment: 3. The clearing, snagging, and channelization work should be accomplished with a minimum of damage to the streambank vegetation. Every effort should be made to maintain the river in as natural a condition as possible.

Response: Agreed, see discussion in Planned Project Section

Comment: 4. We are somewhat confused by the data shown in the tables on pages 52 through 54 of the Upper Little Black Watershed Work Plan. For example, the table shows that in reach 1, the average degree of protection will be three years, but the 100-year flood peak will be reduced by 73 percent. This does not seem logical.

Response: The term "degree of protection" is used to indicate a frequency where no flooding will occur. In this case the 100-year flood peak is reduced a significant amount. However, the channel capacities are so low that a minor amount of flooding will occur for the smaller floods that are greater than the 3 year frequency event.

Comment: 5. It also seems odd that the 100-year flood peak will be reduced by a larger percentage than the two-year peak. The project was designed for protection against the two-year flood, as stated in the top paragraph on page 53 of the work plan. It is improbable that the 100-year flood can be reduced by 73 percent if the two-year flood is reduced by only 60 percent. If the 100-year flood peak can be reduced by 73 percent, then the actual control capacity of the structures is far in excess of the two-year flood and this should be stated in the work plan.

Response: The structures do provide storage to control runoff from floods up to the 100 year frequency. The 100 year flood peak is reduced a larger percentage than the two year peak because the release rate from the majority of the structures remains nearly constant for all flood events.

Comment: 6. The "reduction-in-stage" column seems to have some inconsistency in reach VIII (page 54). For other areas, the reduction increases from two to 100 years, but not for area VIII. It is not clear why the five-year reduction is so much greater than the 100-year reduction.

Response: Reach VIII is the area of the improved channel. The 2-year designed channel has a larger influence on a storm of 5-year frequency than it will have on a 100-year storm.

The design capacity of the improved channel is nearly equal to the peak flows of these lower frequencies, thus resulting in large reduction in stages and quick removal of floodwaters. The larger storms have much greater discharges in relation to the capacity of the channel, thus taking longer to remove floodwaters and resulting in less reduction in stage. Soil Conservation Service criteria in design

of floodwater retarding structures usually results in greater reduction for larger storms while criteria used in the combination of floodwater retarding structures and channel works results in greater reductions for lower frequency storms. A primary objective in project formulation was to provide a channel capacity of 2-year frequency flow for the main channel in the delta area.

Comment: 7. With reference to page 83 of the Lower Little Black Watershed Work Plan and page 91 of the impact statement, the U.S. Geological Survey has operated a peak-flow gaging station on the Little Black River at Highway 160 crossing near Fairdealing for about twenty years. Using procedures outlined by the U.S. Water Resources Council in their Bulletin 15 (1967), the following flood-frequency values were computed for that site:

2-year flood	6,000 cfs
5-year flood	13,400 cfs
25-year flood	25,800 cfs
100-year flood	37,700 cfs

The data shown for the station at Ball Mill Bridge (approximately two miles downstream from Highway 160) are significantly lower than USGS estimates for the 25- and 100-year flood peaks at Highway 160. All Federal agencies were instructed to use Bulletin 15 procedures so that more uniform flood-frequency estimates would be obtained by the agencies. Thus, it is not clear why these results differ by 30 to 40 percent for the 25- and 100-year floods.

Response: During the development of this plan the peak flows determined by our hydrologic model were compared with an analysis of the peaks reported by the USGS for the stream gage near Fairdealing. It was noted there was good agreement for the smaller more frequent events but that our estimates were lower for the larger floods in the 25 to 100 year frequency range. A regional frequency study was then made using runoff data from nearby watersheds having similar runoff conditions. These studies included both flood runoff volumes and peak flows. Particular attention was paid to runoff volumes because they were considered to be the major factor related to damages in the large flat flood plain area below the stream gage.

At the time this study was made only 13 years of continuous record was available at the gage near Fairdealing. Several of the gages used in the regional study had length of records that were more than double the years available at Fairdealing and were, therefore, considered more reliable in interpreting the results of frequency studies.

The results of the regional study indicated that the variability in runoff was in close agreement with the values determined by our hydrologic model. Additional studies were not made to improve the results of the peak flows near the stream gage because the volume of runoff was considered to be the most important item to consider in the evaluation of flood damages in the main damage area.

Comment: 8. We are pleased to note on pages 17 and 94 that a reconnaissance archeological survey will be conducted during work plan review, prior to preparation of the final statement. This survey should cover any lands not previously surveyed by the University of Michigan Powers Phase Project which may be affected by the Little Black River Watershed projects (all lands set aside for floodwater retarding structures, recreation, floodways, multiple purpose flood prevention and drainage ditches, river enlargement, river clearing and snagging, and all other associated activities).

When the survey results have been obtained, the State Historic Preservation Officers for Missouri (Mr. James L. Wilson, Director, Missouri State Park Board, P.O. Box 176, 1204 Jefferson Building, Jefferson City, Missouri 65101) and Arkansas (Mr. William E. Henderson, Director, Arkansas Department of Parks and Tourism, State Capitol--Room 149, Little Rock, Arkansas 72201) should be consulted with regard to any properties within the Little Black River Watersheds which may be eligible for inclusion on the National Register of Historic Places.

Response: The survey is complete and the two State Historic Preservation Officers have been furnished the information and have concluded that 26 of the discovered properties merit recognition on the National Register of Historic Places. Project plans have been modified to avoid impacts on three properties, considered to be most important.

Comment: 9. On page 6, paragraph 2, second sentence, the level of protection should be better defined. "Approximately a 2-year or greater. . ." could mean anything from two to infinity.

Response: This sentence has been changed to read "Approximately a 2-year level of protection was selected. . ."

Comment: 10. Potential impacts related to geologic conditions are adequately discussed in the environmental statement. The occurrences of mineral resources and related industries in the project area have been fairly well detailed in all three documents. However, the documents do not acknowledge the effect of the project on mineral resources and related

industries. Although the planned improvements probably will not commit significant quantities of mineral resources nor adversely effect mineral industries, a statement of such noninvolvement should be included in the final work plans and final environmental statement to assure readers that appropriate consideration has been given to this important economic and environmental component.

Response: See paragraph 3, page 97.

Comment: 11. It is noted on page 63 that two archeological sites listed on the National Register of Historic Places (the Koehler Fortified Archeological Site and the Wilborn-Steinberg Site in Butler County) lie within the watershed, and that these sites will be included in an extensive district designated as the Little Black River Archeological District. If the proposed watershed improvement projects are expected to have any effect on National Register properties, the Soil Conservation Service should consult with the State Historic Preservation Officer concerning application of Section 106 of the National Historic Preservation Act of 1966 and 36 CFR 800 procedures to a determination of the project's impact.

Response: The State Historic Preservation Officers were consulted regarding the significance of properties within the project area. See letters of response in Appendix G.

DEPARTMENT OF TRANSPORTATION, UNITED STATES COAST GUARD

Comment: 1. The environmental impact statement should include a discussion of planning for small boat safety and boating education.

Response: This information has been added to paragraph 4, page 33.

DEPARTMENT OF TRANSPORTATION, REGIONAL REPRESENTATIVE OF THE SECRETARY

Comment: 1. The proposed project includes construction on approximately 80 miles of ditch line involving numerous highway crossings throughout the south and east watershed areas. To what extent will existing roads and associated drainage facilities be affected by this work? Will new or modified highway crossing facilities be required, and, if so, what provision for traffic maintenance and safety will be necessary?

Response: The project will affect both state and county roads. The sponsors are required to secure easements or agreement from the State Highway Commission and County Courts for the modifications or replacements necessary. Standard provisions for traffic maintenance and safety will be used.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Comment: 1. The draft statement indicates the water quality of the Little Black River deteriorates as it flows from the upper reaches of its watershed through the lower watershed prior to its confluence with the Current River. Turbidity, fecal coliform, and phosphorus parameters are noted as being very high in the lower reaches. The stated fecal coliform concentrations exceed the Missouri Water Quality Standards of 200/100 ml for public recreation (whole body contact) and freshwater wildlife. The final statement should identify the source of these pollutants and discuss possible measures of reducing their impacts on the planned recreation areas.

Response: The phosphorus in the upper watershed is believed to be primarily of natural origin. The following paragraph is quoted from Midwest Research Institute's Environmental Assessment on the Little Black River.

"Because there are no known sewage effluents entering the Little Black River or its tributaries and because high concentrations of phosphate were detected in the spring-fed upper watershed, it is possible that the source of the chemical is the result of leaching of geological formations. Agricultural fertilizer applications do not appear to account for the concentrations of the chemical found throughout the watershed at the seasons sampled."

Appendix E contains the water quality information gathered by Midwest Research Institute. Sample station 10 was upstream from the multiple-purpose reservoir and sample station 9 was immediately downstream from the proposed recreation site. All other sample stations were considerably downstream from the multiple-purpose reservoir. The fecal coliform concentration at both of these stations did not exceed 100/100 ml. This is within the Missouri water quality requirements for public recreation. Statements were added to the final environmental impact statement to identify the suspected sources of phosphorus, and better identify reaches polluted by bacteria. (See pages 47 and 80.)

Comment: 2. Phosphorus as phosphate is one of the major nutrients for algal nutrition. In this form it is not normally toxic to aquatic organisms or man. However, sufficient quantities in fresh warm water environments can lead to nuisance growths of algae and other aquatic plant species inducing an accelerated rate of eutrophication. This is especially true when adequate amounts of nitrates or nitrogen

compounds are present in runoff from farming operations. Present concentrations of phosphorus as phosphate are indicated as exceeding the Arkansas Water Quality Standards. The above problems may become acute for the proposed retention structures particularly structure B-9 and the channels to be constructed or improved in the lower watershed.

Response: Water quality was discussed in the third paragraph, page 87.

Present concentrations of phosphorus as phosphate in the lower watershed do exceed the Arkansas Water Quality Standards. A settling basin and a controlled inlet structure are planned for all points of inflow to the multiple-purpose channels in the delta area. These features will significantly reduce the sediment and the pollutants associated with sediment from this delta area. These measures are expected to reduce the phosphorus problems in the lower watershed.

Comment: 3. The final statement should discuss the use of buffer zones and intensive land management techniques for the total project area. This type of control may contribute to the reduction of phosphorus and bacteria into the structures during periods of runoff.

Response: Since much of the upland area is in very low intensity usage, this comment seems to apply only to the delta area where the land is used intensively. The following information has been added to paragraph 5, page 96.

"These collection ditches and field outlets are expected to trap nutrients and pesticides transported with sediment and reduce future pollutant levels in the drainage ditches."

Comment: 4. The crude oil pipeline of the Mobil Oil Company which is located in the upstream portion of recreational pool B-9, should be adequately maintained to avoid leakage or accidental spillage. The probability of accidental spillage of crude oil along this section of pipeline should be included in the final statement. The statement should also evaluate the extent of the impacts which would result from an accident involving crude oil spillage due to valve or pipeline failure.

Response: This subject was discussed on page 13 of the draft environmental impact statement. Mr. Marshall Taylor, Department of Transportation, Kansas City, was contacted by telephone regarding pipeline safety. He reported that the pipeline company was aware of requirements for safe and adequate spill prevention measures. An oil spill would result in

the temporary loss of recreation services and a temporary decrease in the aesthetic qualities of the area.

Comment: 5. The final impact statement should discuss provisions for installation and inspection of waste treatment facilities at the privately controlled ponding areas. Poorly operated septic tanks or private waste treatment systems can result in extensive water quality problems in impoundments.

Response: This subject has been explained on page 16, paragraph 2.

Comment: 6. The final statement should discuss the potential for vector problems (mosquitoes) and identify measures to control this type of nuisance and health problem. The use of pesticides to control these problems could have deleterious effects on water quality especially at recreation pool B-9.

Response: Problem insect control procedures for the recreation areas are shown in paragraph 1, page 33. Mosquitoes at B-9 will be controlled by the standard method, utilizing pool level manipulation. This statement has been added to the paragraph on page 33.

Comment: 7. The public water supply facilities for the recreation areas should be identified. Adequate purification systems for these sources should be supplied and regularly inspected to insure adequate quantities of safe potable water.

Response: The only water supply to be developed as a part of project installation will be the one needed for the Missouri State Park planned at structure B-9. The state will develop this park and will comply with standards for public water supplies.

Comment: 8. The methods of disposal of clearing spoil such as trees, roots, etc., should be identified. We believe burning should be considered only after disposal by other methods have been fully investigated and determined unacceptable or infeasible. Burning should be coordinated with state and local governments to insure that it will not be in violation of states or local regulations. If disposal by burning is adopted, a method such as forced air open-pit burning may be used to reduce particulate emission to the atmosphere.

Response: Compliance with burning regulations of the involved states is noted in item 13, page 27. The following additional information has been added.

"Utilization of cleared vegetation for fuel wood, posts, lumber, or other products will be encouraged to minimize burning."

Comment: 9. The statement indicates that over the life of the project, the flood and sediment retaining structures will gradually fill with sediment. When sedimentation occurs, soil conservation measures may be thwarted along with drainage and flood control. This may result in a possible resumption of the present problems. The final statement should discuss future sediment and flood control when the structures have filled with sediment and are no longer functional.

Response: Paragraph 4 page 87 has been clarified to state that storage of sediment is provided to insure that the flood pools will be able to store the design volume of floodwaters throughout the life of the project (100 years). The changes in public values on economics makes it rather impossible to predict what reclamation measures might be taken at the end of the 100 year period. If no reclamation measures were taken, the dams would continue to function as floodwater retarding structures with their storage capacities gradually being reduced by sediment. This would, over a long period of time, reduce their effectiveness as floodwater retarding structures.

Comment: 10. The proposed project calls for the construction of 1.0 mile of levee. The location, size, and environmental impacts of the borrow areas for this segment of the project should be discussed in the final statement.

Response: The levee cited will be constructed in four separate locations. Borrow will be obtained from adjacent cropland or forested areas. Specific locations will not be identified until detailed plans are made during the operations phase. Additional descriptive information has been added on page 24. The impacts of this construction are described on pages 86 and 90.

Comment: 11. The statement indicates (page 90) that there will not be complete protection against flooding. Land use should be controlled either by flood plain zoning for the areas still subject to flooding or by restrictions which incorporate flood proofing for structures located in the flood prone areas. The Soil Conservation Service should encourage planning and zoning to minimize the hazards of flood damage.

Response: The project has been formulated to provide agricultural protection for an area whose principal use is agriculture. We concur that residual flooding will occur. This hazard has been explained on pages 93 and 95. The Soil Conservation Service has and will continue to encourage planning and zoning to minimize the hazard of flood damages.

Comment: 12. Any channel modification may alter the natural circulation of the ground water. Natural recharge of the ground water may be increased or decreased depending upon location, depth, and other characteristics of the new channel. The possible effects on both the quantity and quality of ground water should be discussed in the final statement.

Response: The area in question does not now have a ground water supply problem. The project is not expected to change this condition. Water quality effects are displayed on page 96.

Comment: 13. A discussion on the synergism of channelization and the possible increase in farm acreage utilization should be included. This could produce a substantial decrease in the acreage suitable for wildlife habitation.

Response: This area of concern has been discussed in paragraph 4, page 93.

Comment: 14. The final statement should indicate provisions for future channel maintenance which will insure that local interests adhere to the environmental provisions stated in the impact statement.

Response: Operation and maintenance are discussed in paragraph 4, page 34. Additional details have been added to the work plan and to the above mentioned paragraph.

Comment: 15. The final statement should discuss the possibility of developing low water sills in the proposed channels to provide a pool type habitat for fish and other aquatic organisms during periods of low flow. If this type of sill would not hamper the discharge of floodwaters, it could be used to maintain a fishery and provide additional recreation for the residents of the area.

Response: Details of over excavation in ditches 1 and 2 are described on page 28. Wet weirs approximately 3 to 4 feet high are included for erosion control and maintaining pools in ditch 3 as discussed on page 21. The combined effects of these measures will provide additional water surface area and greater depths of water in the drainage ditches than exist at present.

ADVISORY COUNCIL ON HISTORIC PRESERVATION

Comment: 1. Pursuant to its responsibilities under Section 102(2)(C) of the National Environmental Policy Act of 1969, the Advisory Council on Historic Preservation has determined that while you have discussed the historical, architectural,

and archeological aspects related to the undertaking, the Advisory Council needs additional information to adequately evaluate the effects on these cultural resources. Please furnish the following additional data:

An indication as to whether or not the proposed watershed project will affect the Little Black River Archeological District, a property which has been nominated by the Missouri State Historic Preservation Officer to the National Register of Historic Places. Because the Little Black River Archeological District has been nominated to the National Register, it is protected by Section 1(3) of Executive Order 11593 of May 13, 1971, and the Council's "Procedures for the Protection of Historic and Cultural Properties" (36 C.F.R. Part 800). A copy of the Council's Procedures is enclosed for your information.

Response: The State Historic Preservation Officer of Missouri reports that project installation will affect 35 sites within the Little Black River Archeological District. These properties are of minor significance and need not be preserved to maintain the integrity of the District and an additional 26 sites which appear to be eligible for nomination. Procedures stipulated by the Advisory Council are being followed.

Comment: 2. An indication as to whether or not additional sites exist in the watershed project area which are eligible for inclusion in the National Register. In the event eligible sites do exist, a determination should be made by the Soil Conservation Service (SCS) as to the project's impact on these sites.

Response: It has been determined that 26 of the locations described by the recent cultural resource assessment are eligible for nomination to the National Register. Project plans have been modified to avoid impacts to the three sites considered most important.

Comment: 3. A brief description of the archeological survey sponsored by SCS, referred to on page 94 of the environmental statement. This description should include a discussion of the survey's methodology, objectives and results.

Response: One copy of the final report "An Assessment of the Cultural Resources of the Little Black Watershed" has been submitted to the Advisory Council.

The survey included an exhaustive records search for known information, and on the ground survey of all areas to be directly affected by project installation. The objective was to locate and assess the significance of cultural

resources within the direct impact areas. Dr. Price concluded that three of the properties located would be eligible for inclusion in the National Register of Historic Places. Project plans have been modified to avoid impacts to these sites.

Comment: 4. In addition, the Advisory Council suggests that the final environmental statement on the Little Black Watersheds project be expanded to include copies of the comments of the Arkansas and Missouri State Historic Preservation Officers.

Response: Copies of comments from these offices are included in Appendix G.

GOVERNOR OF MISSOURI

Comment: 1. Detail plans for any work affecting state highways in Carter County should be approved by the appropriate Missouri Highway Department District Offices before advertising any work for bids. It is preferable that any work affecting state highways be coordinated early in the planning with the appropriate Districts.

Response: As soon as detailed surveys are completed, plans and specifications will be coordinated with the appropriate District.

Comment: 2. The Department of Conservation has expressed concern for the effects on certain species of fish when the free-flowing nature of the river is altered. See the Department's attached letter.

Response: See responses to comments 1, 2, 5, 6 and 8 of the Missouri Department of Conservation letter below.

Comment: 3. Reference to the "State Park Board" should be changed to "Department of Natural Resources, Division of Parks and Recreation" on pages 31 and 63.

Response: These changes have been made.

MISSOURI DEPARTMENT OF CONSERVATION

Comment: 1. Our primary concern is with the fate of the fishery presently found in the Little Black River. We do not agree that the changed flow conditions and water quality will benefit fish without specification. Conversely, the alteration of the free flowing character of the Little Black will reduce the viability of fish populations presently dependent upon a natural flow regimen. Species affected not only include the smallmouth bass, but other riffle species such as darters.

Response: Additional information has been added to the statement to show that fish populations dependent upon natural flow regimens will be detrimentally affected. See pages 98, 100.

Comment: 2. In view of the mandate on Federal agencies by the 1973 Endangered Species Act, this draft environmental statement is generally lacking in the treatment of probable effects. The harlequin darter, for example, a riffle species is given passing mention but further discussion is needed on the probable effects this project might have on its existence.

Response: Impacts on rare and endangered species which can be identified are shown on pages 85 and 90.

Comment: 3. Page 59 - Where are the endangered species listed? If in an appendix, a reference should be provided.

Response: See paragraph 4 and 5, page 61.

Comment: 4. Page 87 - If the 50 acres at the diversion structure and 50 acres elsewhere are for mitigation purposes, then these lands should be identified as such here. The 50 acres at the diversion structure are listed as recreational lands elsewhere.

Response: See additional information added to page 90.

Comment: 5. Page 95 - Changed flow conditions will not benefit all fishes. In fact, these changes may be deleterious to many species in the upper and middle river.

Response: This additional information is contained or has been added to items 4, 5, and 11, pages 100 and 101.

Comment: 6. Page 97 - reduced recruitment of smallmouth bass is fairly likely; reductions in other riffle species may also occur. Structural measures in both the uplands and lowlands may adversely affect rare, declining or endangered species.

Response: This information is contained in paragraph 2, page 87 and paragraph 4, page 90.

Comment: 7. Page 98 - It is highly probable that additional clearing of the flood plain will follow project completion. Experience with similar projects elsewhere should be cited to substantiate these losses.

Response: The extent of project induced clearing is explained in item 13, page 101. The most recent publication on this

subject is "Effect of the Small Watershed Program on Major Uses of Land"--Agricultural Economic Report No. 279, Economic Research Service, February 1975 (see paragraph 5, page V). This document does not substantiate any significant loss due to project installation.

Comment: 8. Page 106 - The loss of free flowing stream fishes should be listed as an irreversible and irretrievable commitment of resources. An estimate of the energy consumption needed for project completion would also qualify in this section.

Response: This impact has been added on page 109.

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Comment: 1. Due to a lack of an adequate survey, I am not in a position to comment on other cultural resources in this area. It is the responsibility of the federal funding agency or licensing agency to survey the project area as stipulated in Federal Executive Order 11593.

However, we have recommended to SCS that a field survey of each direct impact area and construction access routes of the Little Black River Watershed Project be conducted prior to construction of catchment basins. Such a survey would locate and assess the significance of prehistoric and historic sites in the direct impact areas and mitigation measures could be taken prior to construction.

Response: The recommended survey has been made and a copy of the report has been furnished.

Comment: 2. It is also recommended that the U.S. Department of Agriculture Soil Conservation Service and professional archeologists coordinate efforts in the Little Black River Watershed Project so that the project is completed and an important part of our cultural heritage is preserved for future generations.

Response: Project plans have been closely coordinated with all concerned agencies and provisions have been made to avoid impact to significant historical and prehistoric properties. All concerned agencies and groups have been kept informed and requested to provide advise and counsel. The continuing work following prescribed regulations and procedures will insure that project is installed without significant loss to cultural resources.

Comment: 3. The Lower Little Black Watershed Plan should place more emphasis on access points to the river. The river is a vital source of recreation in an area desperately in need of such.

Response: Sponsors for additional recreation developments could not be identified.

Comment: 4. In the absence of precise data on the flows necessary to keep this natural Little Black River channel viable, it is suggested that the operation of the floodway diversion structure be periodically inspected to determine the effect of this diversion upon the siltation, debris and lack of flood scour downstream from the diversion. This is important to preservation of the aesthetic and recreational quality of the Little Black River as a permanent stream.

Response: Assistance from the Missouri Department of Conservation will be requested to determine how the diversion of flood flows affect the Little Black River channel.

THE WILDLIFE SOCIETY, MISSOURI CHAPTER

Comment: 1. We are pleased to find that the project does recognize that terrestrial losses will occur, and that your agency has provided for mitigation measures. These lands should be identified and inspected for compliance for the project's life. The draft Environmental Impact Statement does not identify latent losses from land clearing once flood control is provided. These losses which are likely to occur, will undoubtedly remove vestiges of lowland hardwoods. This particular forest community is becoming a rare type in southeastern Missouri and efforts should be made to preserve in kind. There are many other species of swamp flora associated with these timber stands that also deserve recognition and preservation. Present mitigation measures may not be sufficient in this respect. Another rare terrestrial plant, corkwood, is known to exist in this watershed and hasn't been identified in your draft.

Response: Acceleration of land clearing, as a result of project installation, is described on page 101, item 13. A footnote which refers to the rare species list has been added on page 61, paragraph 1. See response to comment 7 of the Missouri Department of Conservation.

Comment: 2. The Missouri Chapter of the Wildlife Society is of the opinion that the proposed project will alter the present stream ecosystem. The Little Black River is an exceptionally diverse stream. The stream contains many different species of plants and animals in a highly scenic setting. Several rare and endangered species are also known to exist. Every

conceivable measure to preserve the integrity of this ecosystem should be made. Present measures should be specifically listed in your draft.

Response: All impacts on the ecosystem which have been suggested or have been identified are listed in the Environmental Impact Section, which begins on page 84. Measures which will be used to preserve the ecosystem are listed in Environmental Considerations, page 26 and in Fish and Wildlife Mitigation Measures, page 28.

Comment: 3. In addition, probable effects should be matched with workable steps to offset losses so that future losses can be mitigated. Efforts should be made to identify stream changes during and after project construction.

Response: See response to the preceding comment.

Comment: 4. Finally, we would appreciate additional emphasis on the installation of land treatment practices. Experience gained by several of our members indicates that there is no real assurance that improved land treatment measures will be provided on significant acreages of private land unless there is a real incentive to do so. What does the Service plan to do in the event that these incentives are not provided?

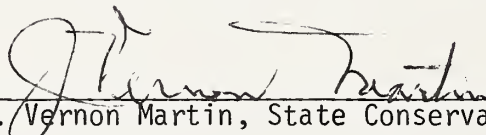
Response: Structural measures will not be installed until appropriate land treatment is completed.

X. LIST OF APPENDICES

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XI.

Approved by


J. Vernon Martin, State Conservationist

Date 6-27-75

APPENDIX A

COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Little Black Watershed, Missouri

(Dollars) a/

Evaluation Unit	AVERAGE ANNUAL BENEFITS					Total	Average Annual Cost ^{c/}	Benefit Cost Ratio
	Damage Reduction	More Intensive Land Use	Drainage	Redevelopment	Recreation			
All structural Measures	1,282,615	292,146	292,145	103,180	206,980	2,390,911	1,326,618	1.8:1.0
Project Administration							165,227	
GRAND TOTAL	1,282,615 ^{b/}	292,146	292,145	103,180	206,980	2,390,911	1,491,845	1.6:1.0

a/ Price base current normalized for agricultural benefits, 1973 prices for all others.

b/ In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of \$60,766 annually. Includes \$251,794 annual benefits from damage reduction in Black Rock, Lockheart-Ferry, Newport, Augusta, and Success reaches of the White River Basin accruing to measures in the watershed.

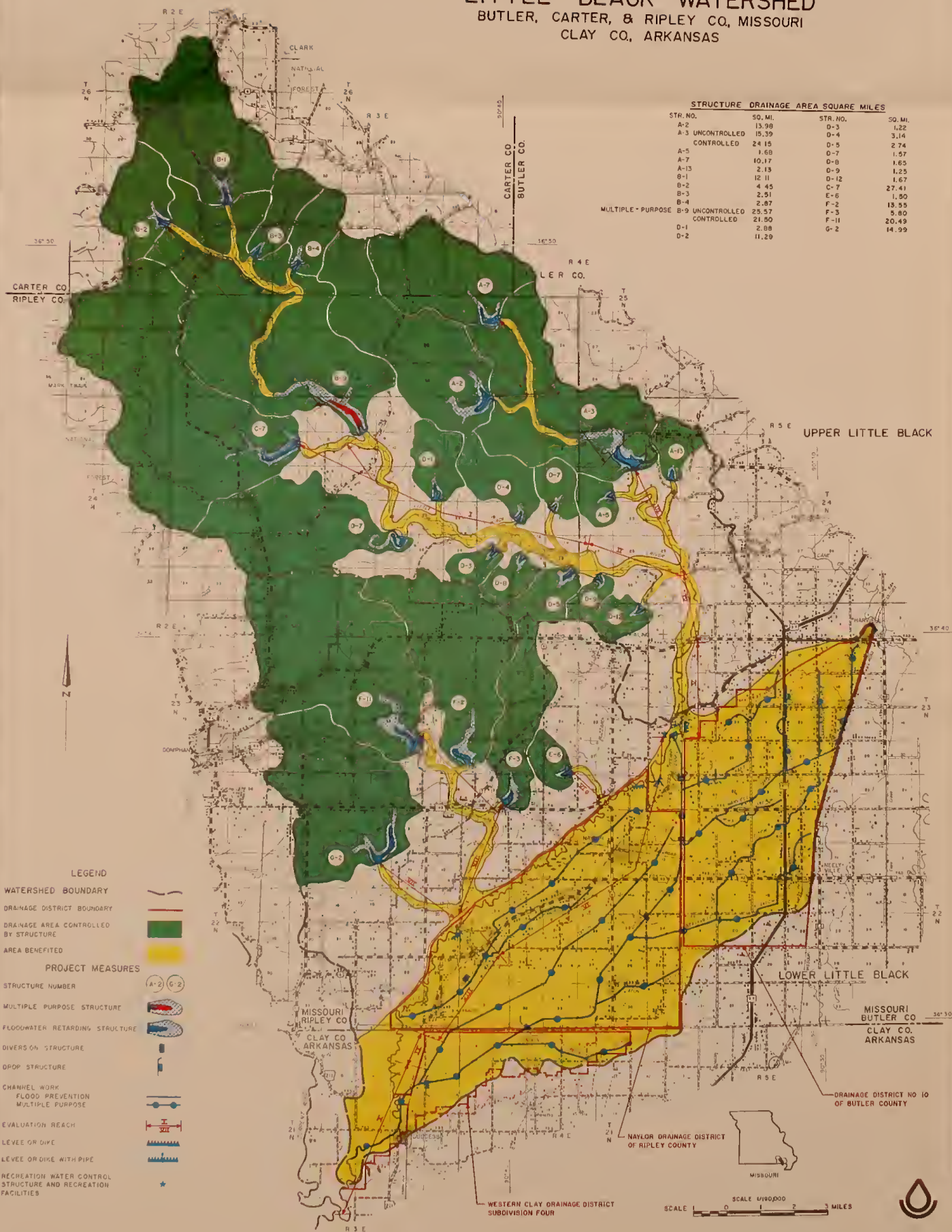
c/ Average annual cost based on amortization at 5-5/8% for 100 years.

June 1974



LITTLE BLACK WATERSHED

BUTLER, CARTER, & RIPLEY CO, MISSOURI
CLAY CO, ARKANSAS



STRUCTURE DRAINAGE AREA SQUARE MILES			
STR. NO.	SQ. MI.	STR. NO.	SQ. MI.
A-2	13.98	D-3	1.22
A-3 UNCONTROLLED	19.39	D-4	3.14
CONTROLLED	24.15	D-5	2.74
A-5	1.68	D-7	1.57
A-7	10.17	D-8	1.65
A-13	2.13	D-9	1.25
B-1	12.11	D-12	1.67
B-2	4.45	C-7	27.41
B-3	2.51	E-6	1.50
B-4	2.87	F-2	13.55
B-9 UNCONTROLLED	25.57	F-3	5.80
CONTROLLED	21.50	F-11	20.49
D-1	2.88	G-2	14.99
D-2	11.29		

- LEGEND**
- WATERSHED BOUNDARY
 - DRAINAGE DISTRICT BOUNDARY
 - DRAINAGE AREA CONTROLLED BY STRUCTURE
 - AREA BENEFITED
 - PROJECT MEASURES**
 - STRUCTURE NUMBER
 - MULTIPLE PURPOSE STRUCTURE
 - FLOODWATER RETARDING STRUCTURE
 - DIVERSION STRUCTURE
 - DROP STRUCTURE
 - CHANNEL WORK
 - FLOOD PREVENTION
 - MULTIPLE PURPOSE
 - EVALUATION REACH
 - LEVEE OR DIKE
 - LEVEE OR DIKE WITH PIPE
 - RECREATION WATER CONTROL STRUCTURE AND RECREATION FACILITIES



APPENDIX C

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APPENDIX D

SUMMARY OF RECREATIONAL FACILITIES

Little Black Watershed, Missouri

ITEM	UNITS	QUANTITY ^{a/}
Roads - Dual Lane Graveled		
From North to swim area	L.F.	3,000
From Highway K to swim area	L.F.	4,800
From swim area through group camp	L.F.	2,200
Site Preparation & Landscaping		
Clearing, grubbing & landscaping	Ac.	60
Seeding, mulching, fertilizer & labor	Ac.	60
Planting trees & shrubs	--	L.S.
Miscellaneous		
Information Signs	Ea.	4
Park & entrance signs	Ea.	2
Wildlife signs	Ea.	200
Electric power lines	L.F.	12,000
Camp area roads	L.F.	8,000
Water distribution lines	L.F.	10,000
Natural trail	L.F.	4,400
Water supply tower	--	1
Directional signs	--	L.S.
Group Camp Areas (2)		
Picnic tables	Ea.	20
Grills	Ea.	40
Toilets - vault type - double unit	Ea.	2
Water hydrant	Ea.	2
Shelter (20' x 40') ^{c/}	Ea.	4
Parking spaces	Ea.	20
Trash can units - 2 can	Ea.	10
Overlook & Picnic Area		
Picnic tables	Ea.	4
Grills	Ea.	4
Trash can units - 2 can	Ea.	2
Toilet - vault type - double unit	Ea.	1
Parking spaces (10' x 20')	Ea.	10
Boat Launch & Picnic Area		
Parking spaces (10' x 40')	Ea.	30
Parking spaces (10' x 20')	Ea.	10
Picnic tables	Ea.	10
Grills	Ea.	10

SUMMARY OF RECREATIONAL FACILITIES

Little Black Watershed, Missouri

ITEM	UNITS	QUANTITY ^{a/}
Boat Launch & Picnic Area (Continued)		
Trash can unit - 2 can	Ea.	7
Toilet - vault type - double unit	Ea.	1
Boat launch ramp - 14' concrete	L.F.	200
Water hydrant	Ea.	2
Swimming Area		
Sand beach - 12" sand depth	Sq.Ft.	74,000
Change house with toilets	Ea.	1
Parking spaces (10' x 20')	Ea.	200
Drinking fountain	Ea.	2
Trash can unit - 2 can	Ea.	10
Life guard chair	Ea.	2
Diving platform	Ea.	2
Interpretive Area		
Parking spaces (10' x 20')	Ea.	25
Picnic tables	Ea.	14
Grills	Ea.	14
Trash can units - 2 can	Ea.	10
Information signs	Ea.	2
Walk In Picnic Area		
Walking bridge	Ea.	1
Picnic tables	Ea.	38
Grills	Ea.	38
Trash can units - 2 can	Ea.	10
Toilet - vault type - double unit	Ea.	2
Information signs	Ea.	1
Drinking fountain	Ea.	1
Playground equipment	--	L.S.
Parking & Picnic Area		
Parking spaces (10' x 20')	Ea.	100
Trail to fishing	L.F.	1,000
Shelter unit - (20' x 40') ^{c/}	--	1
Primitive Camp Area		
Toilet - vault type - double unit	Ea.	1
Development of camp area	--	L.S.
Back pack trail	--	L.S.

SUMMARY OF RECREATIONAL FACILITIES

Little Black Watershed, Missouri

ITEM	UNITS	QUANTITY ^{a/}
Picnic Area Along Creek		
Picnic tables	Ea.	20
Grills	Ea.	20
Water hydrant	Ea.	2
Toilet - vault type - double unit	Ea.	1
Canoe put in - gravel	--	1
Parking spaces (10' X 20')	Ea.	20
Road - gravel 2 way	L.F.	1,000
Information signs	Ea.	1
Drinking fountain	Ea.	1
Central Picnic Area		
Picnic tables	Ea.	125
Grills	Ea.	100
Shelter units (20' x 40') ^{c/}	Ea.	2
Parking spaces (10' X 20')	Ea.	75
Play field	--	L.S.
Drinking fountains	Ea.	3
Water hydrants	Ea.	3
Playground equipment	--	L.S.
Toilet - vault type - double unit	Ea.	2
Campground #1		
Camping spaces ^{b/}	Ea.	74
Parking spaces	Ea.	10
Picnic tables	Ea.	10
Grills	Ea.	5
Trash can units - 2 can	Ea.	3
Restroom - flush type w/showers (23' X 24') ^{d/}	Ea.	1
Information signs	Ea.	2
Drinking fountains	Ea.	2
Water hydrants	Ea.	2
Sanitary dump station	Ea.	1
Campground #2		
Camping spaces ^{b/}	Ea.	55
Restroom - flush type (18' X 20') ^{e/}	Ea.	2
Picnic tables	Ea.	5
Information signs	Ea.	2
Drinking fountains	Ea.	2
Water hydrants	Ea.	2
Grills	Ea.	5

SUMMARY OF RECREATIONAL FACILITIES

Little Black Watershed, Missouri

ITEM	UNITS	QUANTITY ^{a/}
Service Area Complex		
Parking spaces (10' X 20')	Ea.	20
Service building	--	L.S.
Sewer System	--	L.S.
Water System	--	L.S.
Electric lines	L.F.	2,000
Diversion Structure		
Access road - 20' gravel	Ft.	1,400
Parking - 10' x 20' gravel	No.	20
Toilet - vault double unit	Ea.	2
Trash can units	Ea.	4
Boat launch ramp - gravel	Ft.	200

a/ Estimated quantities subject to minor variations at time of detailed planning.

b/ Camp sites include 1 picnic table, 1 grill, parking space, traffic barriers, 1 waste receptacle, grading, and prorated share of access road.

c/ Shelter units include 10 tables, bulletin board, drinking fountain, and a masonry grill with chimney.

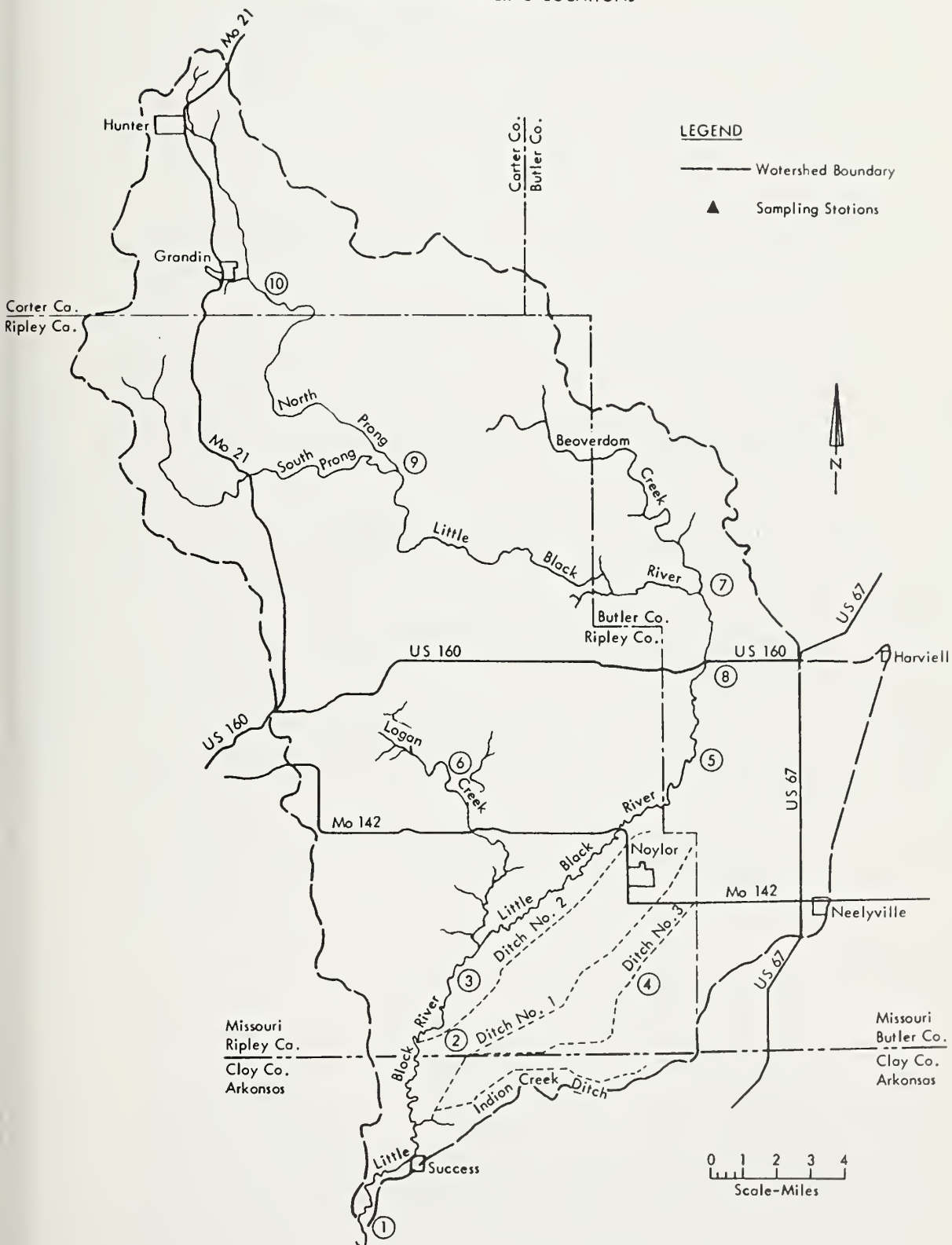
d/ Men's side contains 4 water closets, 4 urinals, 4 showers, and 4 lavatories. Women's side contains 8 water closets, 4 showers, and 4 lavatories.

e/ Men's side contains 3 water closets, 3 urinals, 3 showers, and 3 lavatories. Women's side contains 6 water closets, 3 showers, and 3 lavatories.

APPENDIX E

Water Quality Information as
Reported by Midwest Research
Institute ^{4/}

LITTLE BLACK WATERSHED WATER QUALITY SAMPLING LOCATIONS



WATER QUALITY DATA FROM TEN SAMPLING STATIONS
ON THE LITTLE BLACK RIVER WATERSHED
(January 29 - 30, 1974)

Sampling Station Number

	1	2	3	4	5	6	7	8	9	10
1. Total Coliforms (MPN Count/100 ml)	4,600	5,400	17,000	1,700	350	920	920	920	350	350
2. Fecal Coliforms (MPN Count/100 ml)	460	1,600	460	240	130	110	350	79	130	46
3. Fecal Streptococci (MF Count/100 ml)	690	680	960	480	85	25	230	92	32	19
4. Temperature °C	8.0	8.0	8.5	8.0	8.5	8.0	9.0	7.8	9.0	8.0
5. pH (units)	7.15	6.90	7.25	7.05	7.28	7.60	7.04	7.28	7.40	6.76
6. DO (mg/l)	9.5	9.0	10.9	9.9	10.9	11.4	10.8	12.1	10.8	12.0
7. BOD (mg/l)	2.94	2.96	2.27	2.67	2.02	1.90	1.82	1.69	1.59	1.58
8. Nitrates, NO ₃ , (mg/l)	1.32	3.52	2.20	2.20	3.08	3.52	2.64	3.08	3.52	3.52
9. Ammonia, N (mg/l)	0.38	0.26	0.15	0.33	0.03	0.06	0.17	0.22	0.03	0.06
10. Total Phosphates, P (mg/l)	0.270	0.250	0.200	0.225	0.275	0.150	0.150	0.200	0.175	0.125
11. Ortho Phosphates, P (mg/l)	0.175	0.175	0.110	0.175	0.160	0.150	0.150	0.160	0.120	0.125
12. Total Alkalinity, CaCO ₃ (mg/l)	35.4	37.8	31.0	32.4	26.1	36.8	17.2	26.4	28.3	11.8
13. Total Hardness, CaCO ₃ (mg/l)	39.4	39.7	35.4	37.2	30.0	46.2	19.2	26.4	28.3	14.5
14. Conductivity (μ mhos/cm)	120	88	75	75	63	80	45	62	65	33
15. Total Solids (mg/l)	186.5	135.2	114.8	133.5	96.7	73.9	68.4	73.2	53.6	30.3
16. Dissolved Solids (mg/l)	125.4	89.7	78.0	93.9	71.7	68.9	50.4	54.8	43.8	21.0
17. Turbidity (Formazin units)	90	60	52	51	30	10	10	20	13	10
18. Transparency, Secchi (inches)	8.0	8.0	13.0	9.0	18.5	>30.0	44.0	28.0	>24.0	>24.0

Source: MRI generated

August 1974

WATER QUALITY DATA FROM TEN SAMPLING STATIONS
ON THE LITTLE BLACK RIVER WATERSHED
(March 12-13, 1974)

	Sampling Station Number									
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
1. Total Coliforms (MF Count/100 ml)	35,000	4,000	11,200	9,500	4,900	1,270	1,290	1,360	320	270
2. Fecal Coliforms (MF Count/100 ml)	2,200	800	1,700	860	320	890	68	144	40	16
3. Fecal Streptococci (MF Count/100 ml)	1,650	700	1,030	880	370	74	58	80	32	24
4. Temperature °C	14.0	12.0	13.4	11.8	12.5	12.0	12.0	12.4	12.0	11.8
5. pH (units)	7.0	7.0	7.1	7.1	7.0	7.4	7.1	7.1	7.3	6.7
6. DO (mg/l)	7.8	7.6	8.8	8.8	9.4	10.9	10.2	9.4	10.5	10.9
7. BOD (mg/l)	3.27	2.82	2.20	2.40	2.44	1.50	0.80	1.28	0.66	0.73
8. Nitrates, NO ₃ , (mg/l)	0.44	0.66	1.10	0.44	0.44	0.88	0.66	0.44	0.44	0.88
9. Ammonia, N, (mg/l)	0.34	0.27	0.00	0.00	0.80	0.00	0.00	0.00	0.00	0.00
10. Total Phosphates, P (mg/l)	0.350	0.225	0.230	0.300	0.200	0.080	0.080	0.100	0.080	0.070
11. Ortho Phosphates, P (mg/l)	0.130	0.080	0.080	0.130	0.060	0.060	0.080	0.060	0.080	0.055
12. Total Alkalinity, CaCO ₃ (mg/l)	40.4	35.2	30.9	29.4	19.6	33.8	16.0	24.0	10.0	21.2
13. Total Hardness, CaCO ₃ (mg/l)	47.8	37.6	32.2	30.4	23.8	37.0	26.0	25.1	25.1	14.7
14. Conductivity (μ mhos/cm)	137.0	80.0	60.0	77.0	78.0	102.0	60.0	79.0	71.0	47.0
15. Total Solids (mg/l)	126.1	91.4	89.3	98.6	69.8	62.0	32.3	47.5	26.0	21.2
16. Dissolved Solids (mg/l)	87.3	68.1	51.7	61.7	42.7	50.4	23.0	32.5	23.5	18.5
17. Turbidity (Formazin units)	72.0	55.0	40.0	60.0	18.0	10.0	18.0	25.0	10.0	5.0
18. Transparency, Secchi (inches)	11.5	15.0	16.5	13.0	17.5	>24.0	36.5	23.5	48.0	>24.0

August 1974

Source: MRI Generated

WATER QUALITY DATA FROM TEN SAMPLING STATIONS
ON THE LITTLE BLACK RIVER WATERSHED
(April 30-May 1, 1974)

	Sampling Station Number									
	1	2	3	4	5	6	7	8	9	10
1. Total Coliforms (MF Count/100 ml)	34,000	40,000	30,000	37,000	19,000	41,000	10,500	8,700	6,200	6,100
2. Fecal Coliforms (MF Count/100 ml)	1,600	120	160	110	480	180	190	140	106	86
3. Fecal Streptococci (MF Count/100 ml)	1,710	350	700	200	440	42	88	56	36	30
4. Temperature °C	20.5	19.8	20.2	20.0	20.5	20.0	19.5	20.0	19.5	17.0
5. pH (units)	7.35	7.30	7.55	6.65	7.50	7.70	6.70	6.45	7.50	7.00
6. DO (mg/l)	5.8	6.4	5.4	4.7	6.5	8.2	6.9	7.6	8.0	9.0
7. BOD (mg/l)	2.02	3.27	2.51	2.79	2.25	2.32	2.56	2.02	1.71	1.16
8. Nitrates, NO ₃ , (mg/l)	2.64	2.20	2.64	3.08	2.64	1.76	0.88	0.66	2.64	2.86
9. Ammonia, N, (mg/l)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10. Total Phosphates, P (mg/l)	0.49	1.40	0.59	0.89	0.73	0.46	0.53	0.23	0.35	0.25
11. Ortho Phosphates, P (mg/l)	0.28	0.67	0.32	0.30	0.16	0.23	0.07	0.08	0.06	0.14
12. Total Alkalinity, CaCO ₃ (mg/l)	90.0	118.3	74.2	108.2	79.8	74.3	53.8	78.2	61.6	18.2
13. Total Hardness, CaCO ₃ (mg/l)	92.2	118.2	75.4	108.0	80.0	74.8	60.0	82.2	64.2	33.2
14. Conductivity (μ mhos/cm)	200.0	240.0	155.0	225.0	163.0	158.0	132.0	161.0	133.0	53.0
15. Total Solids (mg/l)	203.9	246.1	176.9	207.4	158.9	130.2	111.8	130.1	85.3	43.3
16. Dissolved Solids (mg/l)	47.1	66.9	50.2	27.6	19.1	3.5	5.2	13.6	1.9	0.7
17. Turbidity (Formazin units)	20.0	25.0	15.0	20.0	12.0	25.0	20.0	15.0	5.0	5.0
18. Transparency, Secchi (inches)	12.0	17.0	19.0	15.0	29.0	>26.0	48.0	39.0	48.0	>24.0

Source: MRI Generated

August 1974

APPENDIX F

POOLS AND FLOW IN DRAINAGE DITCHES OF LOWER LITTLE BLACK

Ditch Name	a/ p (Miles)	Type of Flow b/ I (Miles)	c/ E (Miles)	Total Length (Miles)	Pools Greater Than 3.0 Deep (Acres)	Pools Less Than 3.0 Deep (Miles)
Ditch No. 3	-	11.7	-	11.7	15.1	3.3
Ditch No. 1 (2.7 miles of perennial flow is in (Arkansas)	2.1	7.1	2.8	12.0	7.5	6.0
Ditch No. 2 (includes Lateral No. 2)	-	7.0	4.3	11.3	11.0	1.1
Harviel	-	3.7	5.7	9.4	8.2	1.7
Brown-Taft	-	1.2	4.1	5.3	9.8	1.0
Neelyville-Suder	-	4.0	7.5	11.5	-	-
Eaton Ditch	-	-	3.9	3.9	-	-
Indian Creek Ditch	-	-	6.0	6.0	-	-
TOTAL	2.1	34.7	34.3	71.1	51.6	13.1
					36.9	18.3

a/ Perennial Flow - continuous flow except during period of extreme drought.

b/ Intermittent Flow - continuous flow through some seasons but little or no flow through other seasons. Sustains permanent pools.

c/ Ephemeral Flow - flows only during periods of surface runoff.

APPENDIX G

Letters of Comment Received On
The Draft Environmental Statement

Copy's Cont. No. 16-93828

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
WASHINGTON, D.C. 20310

Tracy W. ...
Deputy Administrator for
Water Resources

Klingenstein
John

15 APR 1975

Honorable Robert W. Long
Assistant Secretary of Agriculture
Washington, D. C. 20250

Control No.

06-93828J
Referred to: SCS

Date: _____

B APR 16 1975

Dear Mr. Long:

In compliance with the provisions of Section 5 of Public Law 566, 83d Congress, the State Conservationist, on behalf of the Administrator of the Soil Conservation Service, by letter dated 27 December 1974, requested the views of the Secretary of the Army on the Watershed Work Plans and the Draft Environmental Statement for the Little Black Watersheds, Missouri and Arkansas.

We have reviewed the work plans and foresee no conflicts with any projects or current proposals of this Department. The draft environmental statement is considered to be generally satisfactory. Our specific comments on the reports are inclosed.

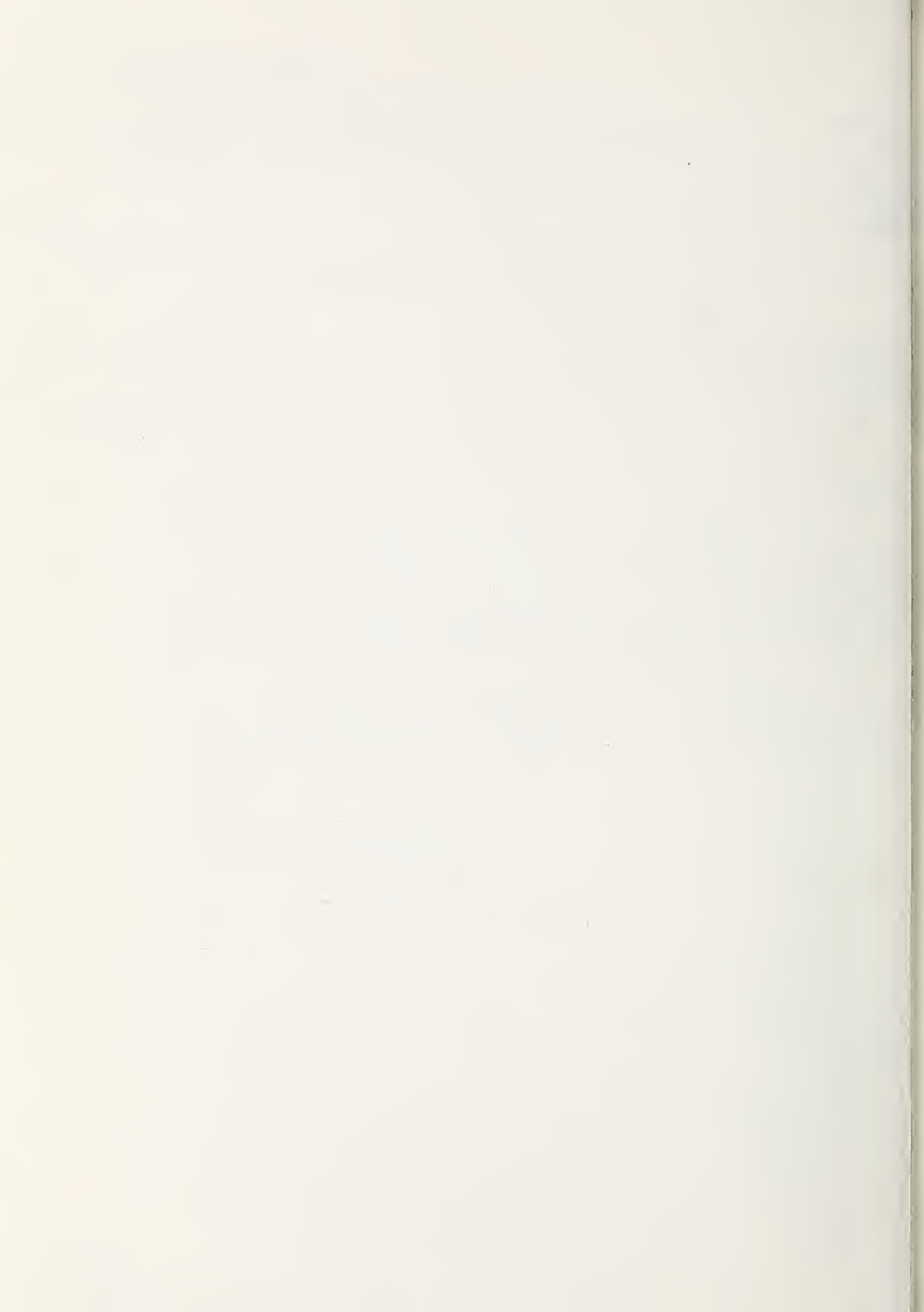
Sincerely,

Charles R. Ford

Charles R. Ford
Deputy Assistant Secretary of the Army
(Civil Works)

1 Incl (dupl)
as





Little Black Watersheds
Missouri and Arkansas

Comments on Watershed Work Plans

1. Lower Little Black Watershed

a. Detailed overflow area maps with and without the project in place, similar in style to Figure 7, should be supplied to allow local government and the local populace to better plan for the future of the area. This map should also contain information to determine the elevation and depth of water. This is especially important in the vicinity of small towns such as Success, Naylor and Neelyville. Less populated areas as well as agricultural areas will find the data useful in construction of structural improvements.

b. Analysis based on Section 73, P.L. 93-251 should be included.

c. Page 95 and Page 121 - The benefits listed on these pages differ in amount.

2. Upper Little Black Watershed Lack of detailed overflow maps
(see comment 1(a)).

3. Draft Environmental Impact Statement Page 3 - A list of alternatives considered includes many alternatives not discussed in the watershed work plan. No explanation is given for the selection or non-selection of these alternatives.





DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

OFFICE OF THE SECRETARY

WASHINGTON, D.C. 20201

APR 29 1975

Mr. J. Vernon Martin
State Conservationist
Soil Conservation Service
Department of Agriculture
P. O. Box 459
Columbia, Missouri 65201

Dear Mr. Martin:

We have reviewed the draft Environmental Impact Statement concerning the Little Black Watershed, Arkansas and Missouri. On the basis of our review we offer the following comments:

1. Pages 46-47, 77-78, and 94 contain considerable demographic information relative to the area affected by the proposed project. However, the total number of people displaced by this project is not given.
2. We feel that the areas of maintenance and vector control should be greatly expanded and/or clarified. For instance:
 - a. Page 31, item 3, "Operation and Maintenance", indicates that land owners will be "encouraged" to perform the needed maintenance for land treatment measures. From the standpoint of public health, will "encouragement" for maintenance prove sufficient for insect control?
 - b. Page 32 speaks to the "multiple purpose structure B-9 and associated recreational facilities," in addition to maintenance for reservoir structures, but does not indicate vector control procedures on public lands.
 - c. Page 33 indicates that operation and maintenance costs will be borne by responsible drainage districts and will include "mowing slopes and ferns along channels for control of undesirable

Page 2 - Mr. Martin

species." Does this include insect and mosquito control?

Thank you for the opportunity to review the draft statement.

Sincerely,

A handwritten signature in cursive script that reads "Charles Custard". The signature is written in dark ink and is positioned above the typed name.

Charles Custard
Director
Office of Environmental Affairs



United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

PEP ER-75/126

Dear Mr. Martin:

Thank you for your letter of January 31, 1975, requesting our views and comments on the draft environmental statement and work plans for the Upper and Lower Little Black Watersheds, Arkansas and Missouri. We have comments on both work plans and the draft statement.

Work Plans

The proposed watershed projects would have no adverse effect on any established or studied unit of the National Park System nor any National Landmark. Also, both documents and the draft statement adequately consider the fish and wildlife aspects of the projects.

From an outdoor recreation viewpoint the possibility of using more of the floodwater retarding structures for recreation should be fully explored. We notice several are close to the town of Doniphan, and their potential development for recreation purposes could be warranted.

The Little Black River appears to have considerable recreation potential. The project sponsors should consider acquiring more access areas to the river, particularly where highways cross. By doing this, access nodes could be provided for entry and exit from the river banks. Recreation developments could be provided at these access nodes.

The clearing, snagging, and channelization work should be accomplished with a minimum of damage to the stream-bank vegetation. Every effort should be made to maintain the river in as natural a condition as possible.

We are somewhat confused by the data shown in the tables on pages 52 through 54 of the Upper Little Black Watershed Work Plan. For example, the table shows that in reach 1, the average degree of protection will be three years, but



the 100-year flood peak will be reduced by 73 percent. This does not seem logical.

It also seems odd that the 100-year flood peak will be reduced by a larger percentage than the two-year peak. The project was designed for protection against the two-year flood, as stated in the top paragraph on page 53 of the work plan. It is improbable that the 100-year flood can be reduced by 73 percent if the two-year flood is reduced by only 60 percent. If the 100-year flood peak can be reduced by 73 percent, then the actual control capacity of the structures is far in excess of the two-year flood and this should be stated in the work plan.

The "reduction-in-stage" column seems to have some inconsistency in reach VIII (page 54). For other areas, the reduction increases from two to 100 years, but not for area VIII. It is not clear why the five-year reduction is so much greater than the 100-year reduction.

With reference to page 83 of the Lower Little Black Watershed Work Plan and page 91 of the impact statement, the U.S. Geological Survey has operated a peak-flow gaging station on the Little Black River at Highway 160 crossing near Fairdealing for about twenty years. Using procedures outlined by the U.S. Water Resources Council in their Bulletin 15 (1967), the following flood-frequency values were computed for that site:

2-year flood	6,600 cfs
5-year flood	13,400 cfs
25-year flood	25,800 cfs
100-year flood	37,700 cfs

The data shown for the station at Ball Mill Bridge (approximately two miles downstream from Highway 160) are significantly lower than USGS estimates for the 25- and 100-year flood peaks at Highway 160. All Federal agencies were instructed to use Bulletin 15 procedures so that more uniform flood-frequency estimates would be obtained by the agencies. Thus, it is not clear why these results differ by 30 to 40 percent for the 25- and 100-year floods.

Environmental Statement

Project Identification

We are pleased to note on pages 17 and 94 that a reconnaissance archeological survey will be conducted during work plan review, prior to preparation of the final statement. This survey should cover any lands not previously surveyed by the University of Michigan Powers Phase Project which may be affected by the Little Black River Watershed projects (all lands set aside for floodwater retarding structures, recreation, floodways, multiple purpose flood prevention and drainage ditches, river enlargement, river clearing and snagging, and all other associated activities).

When the survey results have been obtained, the State Historic Preservation Officers for Missouri (Mr. James L. Wilson, Director, Missouri State Park Board, P. O. Box 176, 1204 Jefferson Building, Jefferson City, Missouri 65101) and Arkansas (Mr. William E. Henderson, Director, Arkansas Department of Parks and Tourism, State Capitol--Room 149, Little Rock, Arkansas 72201) should be consulted with regard to any properties within the Little Black River Watersheds which may be eligible for inclusion on the National Register of Historic Places.

On page 6, paragraph (2), second sentence, the level of protection should be better defined. "Approximately a 2-year or greater. . ." could mean anything from two to infinity.

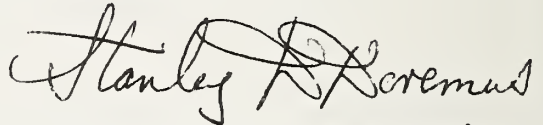
Environmental Impact

Potential impacts related to geologic conditions are adequately discussed in the environmental statement. The occurrences of mineral resources and related industries in the project area have been fairly well detailed in all three documents. However, the documents do not acknowledge the effect of the project on mineral resources and related industries. Although the planned improvements probably will not commit significant quantities of mineral resources nor adversely effect mineral industries, a statement of such noninvolvement should be included in the final work plans and final environmental statement to assure readers that appropriate consideration has been given to this important economic and environmental component.

It is noted on page 63 that two archeological sites listed on the National Register of Historic Places (the Koehler Fortified Archeological Site and the Wilborn-Steinberg Site in Butler County) lie within the watershed, and that these sites will be included in an extensive district designated as the Little Black River Archeological District. If the proposed watershed improvement projects are expected to have any effect on National Register properties, the Soil Conservation Service should consult with the State Historic Preservation Officer concerning application of Section 106 of the National Historic Preservation Act of 1966 and 36 CFR 800 procedures to a determination of the project's impact.

We hope these comments will be of assistance to you in preparing your final documents.

Sincerely yours,



Deputy Assistant

Secretary of the Interior

Mr. J. Vernon Martin
State Conservationist
Soil Conservation Service
Department of Agriculture
Post Office Box 459
Columbia, Missouri 65201



DEPARTMENT OF TRANSPORTATION
REGIONAL REPRESENTATIVE OF THE SECRETARY

ROOM 634, FEDERAL BUILDING
601 EAST 12th STREET
KANSAS CITY, MISSOURI

REGION VII

March 21, 1975

Mr. J. Vernon Martin
State Conservationist
Soil Conservation Service, USDA
P. O. Box 459
Columbia, Missouri 65201

Dear Mr. Martin:

The Draft Environmental Impact Statement for Little Black Watersheds, Arkansas and Missouri, has been reviewed and the Department of Transportation's comments are as follows:

1. No Federal-aid projects are scheduled on the affected highway systems within the next five years.
2. The proposed project includes construction on approximately 80 miles of ditch line involving numerous highway crossings throughout the south and east water shed areas. To what extent will existing roads and associated drainage facilities be affected by this work? Will new or modified highway crossing facilities be required, and, if so, what provision for traffic maintenance and safety will be necessary?

Thank you for the opportunity to comment on this draft. We are looking forward to receiving the final.

Sincerely,

R. R. Waesche
RADM USCG (Ret.)
Secretarial Representative
Region VII

CC:

Mr. John B. Kemp, FHWA
Mr. William E. Loftus, FRA





DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS
U.S. COAST GUARD (G-WS/73)
400 SEVENTH STREET SW
WASHINGTON, D.C. 20590
PHONE (202) 426-2262

• MAR 26 1975

Mr. J. Vernon Martin
State Conservationist
Soil Conservation Service
P. O. Box 459
Columbia, Missouri 65201

Dear Mr. Martin:

This is in response to your letter of 31 January 1975 addressed to the Commandant, U. S. Coast Guard concerning the draft environmental impact statement for the Upper Little Black Watershed and Lower Little Black Watershed, Butler, Carter and Ripley Counties, Missouri and Clay County, Arkansas.

The concerned operating administrations and staff of the Department of Transportation have reviewed the material submitted. The Coast Guard commented as follows:

"The environmental impact statement should include a discussion of planning for small boat safety and boating education."

The Department has no other comments to offer nor do we have any objection to this project.

The opportunity to review this draft statement is appreciated.

Sincerely,

W E. Caldwell

By: [Signature]
[Title]
[Address]
[City, State, Zip]





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII
1735 BALTIMORE - ROOM 249
KANSAS CITY, MISSOURI 64108

March 31, 1975

Mr. J. Vernon Martin
State Conservationist
U.S. Department of Agriculture
Soil Conservation Service
P.O. Box 459
Columbia, Missouri 65201

Dear Mr. Martin:

Re: Little Black Watersheds, Butler, Carter and Ripley
Counties, Missouri and Clay County, Arkansas

We have reviewed the draft environmental impact statement for the referenced project. The proposed project and statement are rated ER-2 indicating we have environmental reservations concerning water quality for many of the proposed recreation areas and the statement should contain additional information to assess the future impacts of the project. The following are our comments:

Water Quality

The draft statement indicates the water quality of the Little Black River deteriorates as it flows from the upper reaches of its watershed through the lower watershed prior to its confluence with the Current River. Turbidity, fecal coliform and phosphorus parameters are noted as being very high in the lower reaches. The stated fecal coliform concentrations exceed the Missouri Water Quality Standards of 200/100 ml. for public recreation (whole body contact) and freshwater wildlife. The final statement should identify the source of these pollutants and discuss possible measures of reducing their impacts on the planned recreation areas.

Phosphorus as phosphate is one of the major nutrients for algal nutrition. In this form it is not normally toxic to aquatic organisms or man. However, sufficient quantities in fresh warm water environments can lead to nuisance growths of algae and other aquatic plant species inducing an accelerated rate of eutrophication. This is especially true when adequate amounts of nitrates or nitrogen compounds are present in runoff from farming operations. Present concentrations of phosphorus as phosphate are indicated as exceeding the Arkansas Water Quality Standards. The above problems may become acute for the proposed retention structures particularly structure B-9 and the channels to be constructed or improved in the lower watershed.

The final statement should discuss the use of buffer zones and intensive land management techniques for the total project area. This type of control may contribute to the reduction of phosphorus and bacteria into the structures during periods of runoff.

The crude oil pipeline of the Mobil Oil Company which is located in the upstream portion of recreational pool B-9, should be adequately maintained to avoid leakage or accidental spillage. The probability of accidental spillage of crude oil along this section of pipeline should be included in the final statement. The statement should also evaluate the extent of the impacts which would result from an accident involving crude oil spillage due to valve or pipeline failure.

The final impact statement should discuss provisions for installation and inspection of waste treatment facilities at the privately controlled ponding areas. Poorly operated septic tanks or private waste treatment systems can result in extensive water quality problems in impoundments.

The final statement should discuss the potential for vector problems (mosquitoes) and identify measures to control this type of nuisance and health problem. The use of pesticides to control these problems could have deleterious effects on water quality especially at recreation pool B-9.

The public water supply facilities for the recreation areas should be identified. Adequate purification systems for these sources should be supplied and regularly inspected to insure adequate quantities of safe potable water.

Air Quality

The methods of disposal of clearing spoil such as trees, roots, etc., should be identified. We believe burning should be considered only after disposal by other methods have been fully investigated and determined unacceptable or infeasible. Burning should be coordinated with state and local governments to ensure that it will not be in violation of states or local regulations. If disposal by burning is adopted a method such as forced air open-pit burning may be used to reduce particulate emission to the atmosphere.

General Comments

The statement indicates that over the life of the project, the flood and sediment retaining structures will gradually fill with sediment. When sedimentation occurs, soil conservation measures may be thwarted along with drainage and flood control. This may result in a possible resumption of the present problems. The final statement should discuss future sediment and flood control when the structures have filled with sediment and are no longer functional.

The proposed project calls for the construction of 1.0 mile of levee. The location, size and environmental impacts of the borrow areas for this segment of the project should be discussed in the final statement.

The statement indicates (page 90) that there will not be complete protection against flooding. Land use should be controlled either by floodplain zoning for the areas still subject to flooding or by restrictions which incorporate flood proofing for structures located in the flood prone areas. The Soil Conservation Service should encourage planning and zoning to minimize the hazards of flood damage.

Any channel modification may alter the natural circulation of the ground water. Natural recharge of the ground water may be increased or decreased depending upon location, depth, and other characteristics of the new channel. The possible effects on both the quantity and quality of ground water should be discussed in the final statement.

A discussion on the synergism of channelization and the possible increase in farm acreage utilization should be included. This could produce a substantial decrease in the acreage suitable for wildlife habitation.

The final statement should indicate provisions for future channel maintenance which will ensure that local interests adhere to the environmental provisions stated in the impact statement.

The final statement should discuss the possibility of developing low water sills in the proposed channels to provide a pool type habitat for fish and other aquatic organisms during periods of low flow. If this type of sill would not hamper the discharge of flood waters, it could be used to maintain a fishery and provide additional recreation for the residents of the area.

We appreciate this opportunity to review and comment on the draft statement. Please furnish three copies of the final to us when it is filed with the Council on Environmental Quality.

Very truly yours,



Edward C. Vest
Environmental Impact Statement
Coordinator

Advisory Council
On Historic Preservation
1522 K Street N.W. Suite 450
Washington D.C. 20005

March 25, 1975

Mr. J. Vernon Martin
State Conservationist
Soil Conservation Service
U. S. Department of Agriculture
P.O. Box 459
Columbia, Missouri 65201

This is in response to your request of January 31, 1975 for comments on the draft environmental statement for Little Black Watersheds, Butler, Carter, and Ripley Counties, Missouri, and Clay County, Arkansas.

Pursuant to its responsibilities under Section 102(2)(C) of the National Environmental Policy Act of 1969, the Advisory Council on Historic Preservation has determined that while you have discussed the historical, architectural, and archeological aspects related to the undertaking, the Advisory Council needs additional information to adequately evaluate the effects on these cultural resources. Please furnish the following additional data:

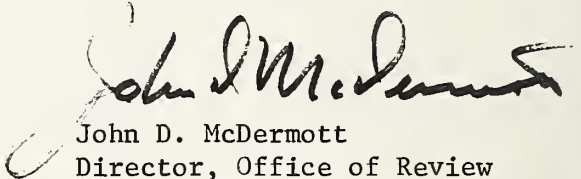
1. An indication as to whether or not the proposed watershed project will affect the Little Black River Archeological District, a property which has been nominated by the Missouri State Historic Preservation Officer to the National Register of Historic Places. Because the Little Black River Archeological District has been nominated to the National Register, it is protected by Section 1(3) of Executive Order 11593 of May 13, 1971, and the Council's "Procedures for the Protection of Historic and Cultural Properties" (36 C.F.R. Part 800). A copy of the Council's Procedures is enclosed for your information.
2. An indication as to whether or not additional sites exist in the watershed project area which are eligible for inclusion in the National Register. In the event eligible sites do exist, a determination should be made by the Soil Conservation Service (SCS) as to the project's impact on these sites.
3. A brief description of the archeological survey sponsored by SCS, referred to on page 94 of the environmental statement. This description should include a discussion of the survey's methodology, objectives and results.

In addition, the Advisory Council suggests that the final environmental statement on the Little Black Watersheds project be expanded to include

copies of the comments of the Arkansas and Missouri State Historic Preservation Officers.

Should you have any questions or require additional assistance, please contact Jordan Tannenbaum at 202/254-3380, of the Advisory Council staff.

Sincerely yours,



John D. McDermott
Director, Office of Review
and Compliance

Enclosure

KANSAS HISTORIC PRESERVATION PROGRAM

WEST THIRD STREET, LITTLE ROCK, ARKANSAS 72201 501 374-0375

STORY



"THE OLD STATE HOUSE" 300 WEST MARKHAM LITTLE ROCK, ARKANSAS 72201
TELEPHONE - 501 374-1111

June 16, 1975

J. Vernon Martin
State Conservationist
United States Department of Agriculture
P.O. Box 459
Columbia, Missouri 65201

Re: Little Black Watershed
Clay County, Arkansas

Dear Mr. Martin:

This letter is written in response to your inquiry of May 23, 1975, regarding properties of architectural and historical significance in the area of the proposed Little Black Watershed in Clay County, Arkansas.

The professional staff of the Arkansas Historic Preservation Program has reviewed the available material which pertains to the area in question. The staff reports that several historic sites and structures are located within the city limits of Corning, including the Sheeks House at the corner of Market and Second Streets which has recently been nominated to the National Register for Historic Places. Another significant historic property in Clay County is the site of Chalk Bluff, located two miles north of St. Francis on the St. Francis River (see attached map). These are the only National Register properties located in Clay County, Arkansas.

In response to your specific questions:

1. The sites listed on page 313 are located in Missouri, and our office has no information on these sites. For any assessment of their significance, you should contact the Missouri Historical Survey and Planning Office.
2. The Little Black River Archeological District is located in Missouri, and you should contact Missouri officials concerning this site. For questions on archeological sites in Arkansas, please contact:

Ms. Hester Davis
State Archeologist
Arkansas Archeological Survey
University of Arkansas
Fayetteville, Arkansas 72701

3. Yes.

4. Yes.

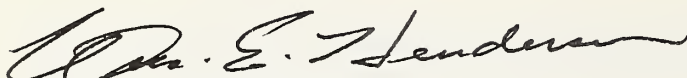
Mr. J. Vernon Martin

-2-

June 16, 1975

Please contact our office if there are any further questions.

Sincerely,

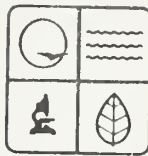
A handwritten signature in cursive script, reading "W. E. Henderson". The signature is fluid and elegant, with a long, sweeping underline.

William E. Henderson
State Historic Preservation Officer

WEH:cal

Enclosure

CHRISTOPHER S. BOND
GOVERNOR



JAMES L. WILSON
DIRECTOR

missouri department of natural resources

P.O. Box 176

Jefferson City, Missouri 65101

314-751-3332

June 11, 1975

Mr. J. Vernon Martin
State Conservationist
State Conservation Service
P.O. Box 459
Columbia, Missouri 65201

Dear Mr. Martin:

In response to your request for recommendations on the Little Black Watershed, I have the following comments to make:

I concur that the Mule Camp (23RIH34) and the B-9 Structure Site (23RI164) appear to be eligible for nomination to the National Register of Historic Places. To assist you in meeting your requirements for nomination of eligible sites, under Executive Order 11593 Section 2 (a), my staff is preparing the nomination forms for these two sites. There were also 48 other sites located through the survey which are not included within the boundaries of sites presently listed on the National Register of Historic Places. The following representative sample of these 48 sites appear to be eligible for nomination to the Register:

23BU116
23BU118
23RI157
23RI158
23RI159
23RI161
23RI160
23RI117
23RIH30
23RIH13
23RIH45
23CTH7
23BUH12

23RIH36
23BUH14
23RIH46
23RIH42
23RIH43
23RIH44
23CTH4
23RIH31
23CTH1
23RIH40

Tram in Mule Camp Hollow

Tram in the Valley of the Middle Fork

Any impact on sites within the Little Black River Archaeological District, the Koehler Fortified Archaeological Site, or the Wilborn-Steinberg Site will affect the integrity of these sites and district. However, if after all prudent and feasible alternatives for avoiding adverse effects to these 35 sites which are located in the direct impact zone have been exhausted, I will consent to their destruction if they are first professionally tested, mapped, and excavated (when necessary) to secure from them the potential information for which they were

J. Vernon Martin
Soil Conservation Service
Columbia, Missouri 65201
June 11, 1975
Page 2

nominated. The Little Black River Archaeological District is significant because it has the potential of providing the professional community with a complete data resource bank on the settlement system of the area. Destruction of sites within the district without first securing information from them would seriously reduce the integrity for which the district was nominated.

I commend you for modifying your plans as outlined on page 25 of the Environmental Impact Statement in order to avoid adverse impacts to 23BU97, 23RI102, 23RI164, and 23BU10. My recommendations for mitigation of adverse impacts to other significant sites outside the boundaries of the sites listed on the National Register of Historic Places is outlined in No. 5.

I concur that adequate measures have been taken by the Soil Conservation Service to allow for preliminary public input and review of the project's impact on known (as of November 11, 1974) sites within the Little Black River Archaeological District. However, I must refer you to the National Advisory Council for determination of compliance with section 800.5(b) and (c) of the Council procedures.

I do find that adverse impacts will occur as a result of project installation and recommend the following mitigative measures be considered for the additional significant representative sample of sites, listed under No. 1 above, not included within the boundaries of sites listed on the National Register of Historic Places.

- A. Of the five sites on high terraces in stream valleys in the Ozark Escarpment which are not within the boundaries of the sites listed on the National Register of Historic Places (23BU116, 23BU118, 23BU119, 23RI157, and 23RI158) I recommend that 23BU116 receive extensive archaeological testing, 23BU118 receive less extensive or moderate testing, and 23RI157 and 23RI158 receive minimal testing.
- B. Of the ten sites on low terraces in stream valleys in the Ozark Escarpment which are not within the boundaries of the sites listed on the National Register of Historic Places (23RI152, 23RI153, 23RI154, 23RI155, 23RI156, 23RI159, 23RI160, 23RI161, 23RI162, and 23RI163), I recommend that 23RI159 receive extensive testing, 23RI161 receive minimal testing, and 23RI160 be avoided during construction activities.
- C. The Archaic Site 23BU117 should receive minimal archaeological testing.
- D. Of the four moonshine stills (23BUH13, 23RIH30, 23RIH33, and 23RIH47), I recommend that a metal detector survey be made of 23RIH30 and 23RIH13 and distribution maps of metal artifacts be made of each.
- E. Of the five late nineteenth to early twentieth century houseplaces not included within the boundaries of the sites listed on the National Register of Historic Places (23BUH12, 23CTH7, 23RIH32, 23RIH37, and 23RIH45), I recommend 23RIH45 receive minimal testing, 23CTH7 be surface collected, and 23BUH12 receive extensive photographic coverage.

J. Vernon Martin
Conservation Service
Columbia, Missouri 65201
11, 1975
3

- F. Of the six mid-nineteenth century houseplaces not included within the boundaries of sites listed on the National Register of Historic Places (23BUH11, 23BUH14, 23CTH2, 23RIH36, 23RIH42, and 23RIH46), I recommend 23RIH36 receive extensive testing, 23BUH14 and 23RIH46 receive minimal testing, and 23RIH42 be avoided when securing dirt for levees to be built around 23RIH38 and 23RIH41.
- G. The Emmons School, 23RIH43, should be avoided during construction of recreation areas.
- H. Of the three historic cemeteries (23RIH38, 23RIH41, and 23RIH44), if levees for coffer dams are built around 23RIH38 and 23RIH41, I recommend the area from which the borrow dirt is to be secured be professionally surveyed. Since the removal of 23RIH44 (McKague Cemetery) will destroy pertinent information regarding pioneer Euro-American mortuary practices, demography, pathology, status values on the frontier, and folk superstitions, I recommend this site either be preserved or a professional physical anthropologist and archaeologist participate in the removal activities. Should an untrained individual move the cemetery, the above information will be irretrievably lost!
- I. Of the three large lumber camps and towns (23CTH4, 23RIH31, and 23RIH34), I recommend that the dam be moved and the spillway rerouted to avoid 23CTH4. If this alternative is not prudent and feasible, extensive testing and mapping of the site is recommended. Site 23RIH31 is .5 mile from the direct impact zone, but caution should be taken to avoid damage to the site by construction activities.
- J. Of the five mentioned logging trams and roads (23CTH1, 23CTH3, 23RIH40, the tram in Mule Camp Hollow, and the tram in the valley of Middle Fork), I recommend that maps be made to show routes and distance and test pit cross-sections be made to determine construction techniques of all but 23CTH3.
- K. One site of an unknown function is described (23CTH5). Based on concentrations of metal artifacts, this site is a small concentrated area of suspected logging activity dating probably from around the late nineteenth century. I recommend moderate testing of this site.

Continuation of close coordination between the Soil Conservation Service and the State

Mr. J. Vernon Martin
Soil Conservation Service
Columbia, Missouri 65201
June 11, 1975
Page 4

Historical Preservation Officer as more detailed plans of the project are developed strongly recommended. If you have any questions or comments, or if we can be of further assistance, please feel free to contact us.

Sincerely,

DEPARTMENT OF NATURAL RESOURCES



James L. Wilson
Director and
State Historic Preservation
Officer

JLW:rcn

cc: Ann Webster Smith
Jordan Tannenbaum
Roy Reaves
Mark Barnes
William E. Henderson
Jim Price
Hester Davis
Joe Marshall

EXECUTIVE OFFICE
STATE OF MISSOURI
JEFFERSON CITY

CHRISTOPHER S. BOND
GOVERNOR

March 31, 1975

Mr. J. Vernon Martin
State Conservationist
Missouri Department of Agriculture
Soil Conservation Service
P.O. Box 459
Columbia, Missouri 65201

Dear Mr. Martin:

The State of Missouri has reviewed the draft Work Plans for the Lower Little Black Watershed and the Upper Little Black Watershed as well as the draft Environmental Impact Statement for Little Black Watersheds. These proposals are for small watershed projects consisting of floodwater retarding structures, a multipurpose structure, a diversion structure floodway channel and multi-purpose ditches. Several state agencies have communicated with me in regard to the projects, and although I concur with the need for the projects and wish to expedite their completion, there are still certain areas which warrant my comments and your attention.

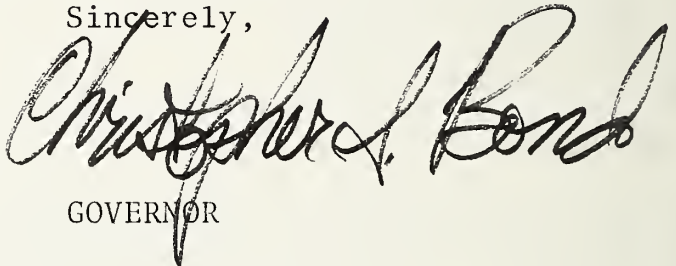
- 1) Detail plans for any work affecting state highways in Carter County should be approved by the appropriate Missouri Highway Department District Offices before advertising any work for bids. It is preferable that any work affecting state highways be coordinated early in the planning with the appropriate Districts.
- 2) The Department of Conservation has expressed concern for the effects on certain species of fish when the free-flowing nature of the river is altered. See the Department's attached letter.
- 3) Reference to the "State Park Board" should be changed to "Department of Natural Resources, Division of Parks and Recreation" on pages 31 and 63.

Mr. J. Vernon Martin
March 31, 1975
Page 2

The State Historic Preservation Officer, James L. Wilson, has already commented regarding the archaeological and historical resources of the area and your continuing cooperation with him and his staff is appreciated.

Thank you for the opportunity to comment.

Sincerely,

A handwritten signature in dark ink, appearing to read "Christopher S. Bond". The signature is fluid and cursive, with the first name "Christopher" written in a larger, more prominent script than the last name "Bond".

GOVERNOR

CSB:prw

Enclosures

cc: James L. Wilson, Director
Department of Natural Resources
Carl R. Noren, Director
Department of Conservation
Robert N. Hunter, Chief Engineer
State Highway Department



OZARK FOOTHILLS REGIONAL PLANNING COMMISSION

BOX 124

ELLSINORE, MISSOURI 63937

PHONE 322-5215

February 11, 1975

Vernon Martin
e Conservationist
ed States Department of Agriculture
Conservation Service
. Box 459
mbia, Missouri 65201

Mr. Martin:

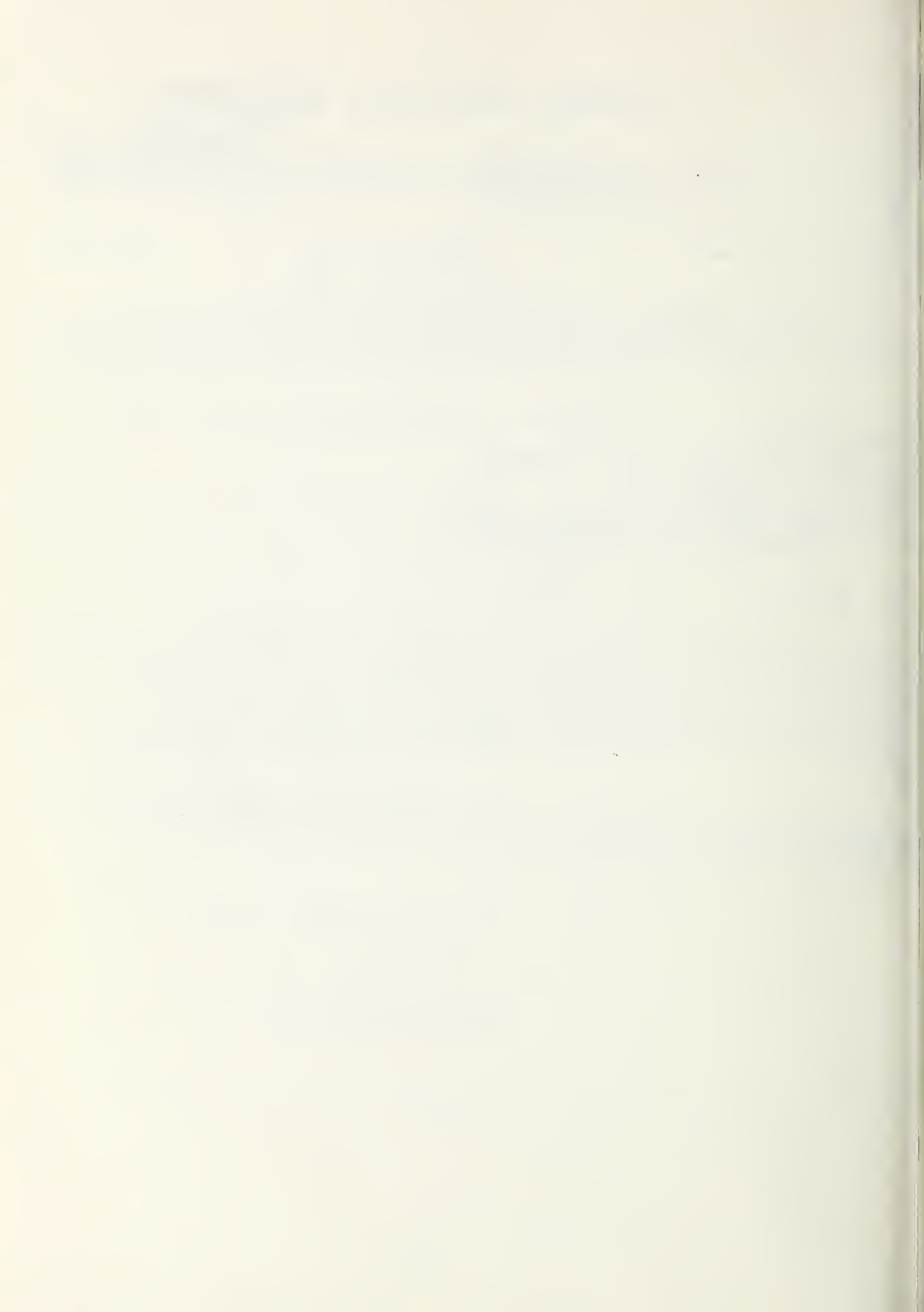
is to acknowledge receipt of your letter dated February 3
erning the plan for the Upper Little Black Water Shed Project
ouri, and the Lower Little Black Water Shed Project Missouri
Arkansas. The Ozark Foothills Regional Planning Commission
already reviewed your project under it's A-95 review function
has found it to be within the plans of the Ozark Foothills
on.

is a letter to acknowledge receipt of your work plans for
proposed project and indicate to you our full support in the
lopment of such a worthwhile project.

Warmest personal regards,

Brent Tinnin

Brent Tinnin
Executive Director





STATE OF ARKANSAS
DEPARTMENT OF PLANNING
400 TRAIN STATION SQUARE • VICTORY AT MARKHAM
LITTLE ROCK 72201

DAVID PRYOR
GOVERNOR

CHARLES T. CROW
DIRECTOR

March 25, 1975

J. Vernon Martin
State Conservationist
Soil Conservation Service
Post Office Box 459
Columbia, Missouri 65201

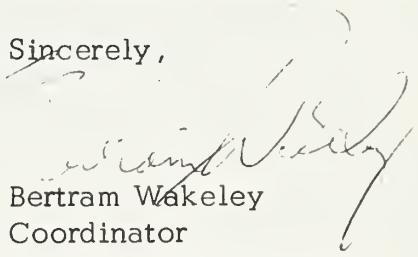
Re: Draft Work Plan, Upper and
Lower Little Black Watershed
Draft Environmental Impact
Statement, Little Black Watershed

Dear Mr. Martin,

The State Planning and Development Clearinghouse is in receipt of the above mentioned Draft Environmental Impact Statement/Work Plan submitted by the Missouri Soil Conservation Service for the purpose of review and comments by Arkansas State Agencies. The documents were distributed to those State Agencies charged with the responsibility for reviewing Environmental Impact Statements.

The comments of the responding Agencies are enclosed for your consideration. If we can be of further assistance please let us know.

Sincerely,


Bertram Wakeley
Coordinator
Office of State Planning
Coordination

BW/fk/cg



ARKANSAS



MISSIONERS
E. CHAIRMAN
ITH
IRHAN VICE CH
LEWIS

MULLEN
HENDRIX

ANDERS
LLE
IBSON

DEPARTMENT OF COMMERCE
DIVISION OF SOIL AND WATER RESOURCES

UNITED STATES DEPARTMENT OF COMMERCE
DIVISION OF SOIL AND WATER RESOURCES
LITTLE ROCK, ARKANSAS 72201

March 21, 1975

RECEIVED
MAR 24 1975

ARKANSAS DEPARTMENT
OF PLANNING

Mr. Bertram Wakeley, Director
State Planning and Development Clearinghouse
Department of Planning
Victory at Markham
Little Rock, Arkansas 72201

Re: Draft E.I.S. and Work Plan for Little Black River Watershed in
Arkansas and Missouri

Dear Mr. Wakeley:

Enclosed please find copies of the comments we received and made
concerning the reports previously mentioned. No adverse or controversial
comments were made.

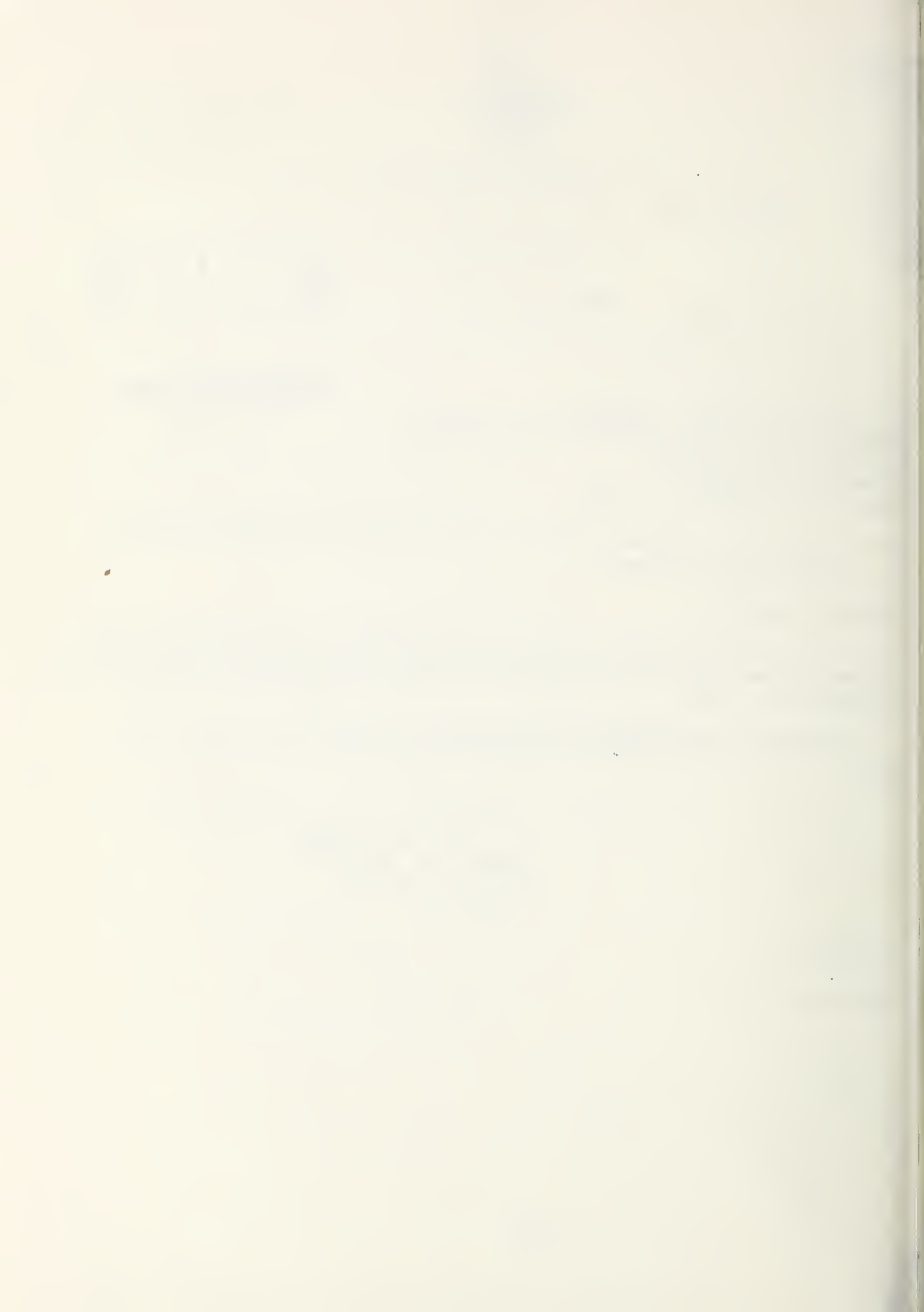
Therefore, we recommend the comments be sent to the sponsoring
agency with notification of favorable review.

Sincerely,

John P. Saxton
John P. Saxton
Director

JPS:ADF:cc

Enclosures





RECEIVED
JUL 1 1975
U.S. DEPT. OF COMMERCE
DIVISION OF SOIL & WATER RESOURCES

DEPARTMENT OF COMMERCE
DIVISION OF SOIL AND WATER RESOURCES

1400 WEST LARK DRIVE, ROOM 300
LITTLE ROCK, ARKANSAS 72204

March 21, 1975

MEMORANDUM

TO: Norman Williams, Director
Geology Commission

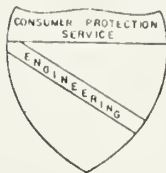
FROM: John P. Saxton, Director
Division of Soil & Water Resources

RE: Draft E.I.S. and Work Plan for Little Black River Watershed

We have reviewed the above referenced reports and made comments on the preliminary drafts. Our questions were answered and comments referenced in these reports. Therefore, we have no further comments at this time.

JPS:ADF:cc

ARKANSAS STATE DEPARTMENT OF HEALTH
4815 WEST MARKHAM STREET
LITTLE ROCK



RECEIVED

FEB 19 1975

SOIL AND WATER
RESERVATION COMMISSION

February 20, 1975

Mr. John P. Saxton, Director
Soil and Water Resources Division
1200 Westpark Building
Third Floor
Little Rock, Arkansas 72204

Re: Draft Environmental Impact Statement
Little Black Watersheds
75 E 425

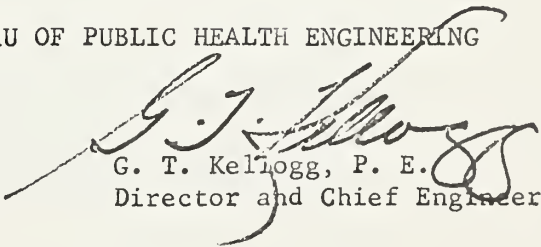
Dear Mr. Saxton:

The captioned statement, transmitted by your memorandum of February 10, 1975, has been reviewed, and we find there is no particular health significance. Therefore, we have no comments.

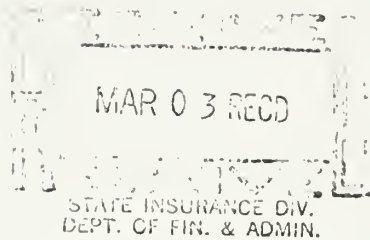
This statement will be retained for our files.

Yours truly,

BUREAU OF PUBLIC HEALTH ENGINEERING


G. T. Kellogg, P. E.
Director and Chief Engineer

GTK:RNS:bn



ARKANSAS GAME AND FISH COMMISSION
February 27, 1975

MEMORANDUM TO: John P. Saxton, Chairman,
Technical Review Committee

FROM: Richard W. Broach, Member,
Technical Review Committee

Responsive to a memorandum from the State Planning and Development Clearinghouse of February 10, 1975, we have reviewed the work plans and draft Environmental Impact Statement for the Little Black Watershed S.C.S. project. This project is located mostly in Missouri and we have commented in the past on this project (copies attached) and will offer no further comments at this time.

RWB:ac

cc: State Planning & Development Clearinghouse

U. S. Fish & Wildlife Service, Vicksburg

TO	INITIALS
SAXTON	
BRYNARSKI	
CAMPBELL	
FOUNTAIN	
YOUNG	
STOKES	
REYNOLDS	
WHITE	
STUBBS	
LYNCH	
COLEMAN	

MAR 4 1975
SOIL AND WATER
CONSERVATION COMMISSION


ARKANSAS GAME AND FISH COMMISSION

LITTLE ROCK, ARKANSAS

May 16, 1974

MEMORANDUM

TO: Mr. J. Vernon Martin
State Conservationist
S.C.S.
P. O. Box 459
Columbia, Missouri 65201

FROM: D. G. Criner 

We received the Work Plan for the Lower Little Black Watershed, Butler and Ripley Counties, Missouri and Clay County, Arkansas and a letter from our director was sent to you May 13, 1974.

After further review of the Work Plan, we request an interpretation on page 62 of the paragraph.

"One loop of the Little Black River channel in Arkansas (approximately 0.5 miles long) will be cut off by construction of the outlet for Ditch No. 3 into Little Black River. This loop will be blocked at both ends, and pipe culverts will be installed to preserve the loop, maintain existing water levels, and provide an outlet for local drainage. This cutoff is located in Sec. 14, T21N, R3E."

We are not clear as to whether or not this bend-way will receive drainage from agricultural ditches.

We recommend that the bend-way be totally isolated and any drainage diverted around and directly into the river.

We would appreciate it very much if you will clarify this point for us.

DGC:lmb

cc: D. Broach
A. Hulsey
J. Atkins
B. Keith

COLLUM
HAIRMAN
UTTIGART

D. SCOTT
HAIRMAN
ASHVILLE

GRIFFIN
NESBORO

NELSON
THEVILLE

FENTER
RLESTON

BOWERS
IARRISON

MAHONY
DORADO

JOHNSTON
THEVILLE



Arkansas

Game and Fish Commission

LITTLE ROCK, ARKANSAS 72201

May 13, 1974



Mr. J. Vernon Martin
State Conservationist
U. S. Department of Agriculture
Soil Conservation Service
P.O. Box 459
Columbia, Missouri 65201

Dear Mr. Martin:

The work plan for the Lower Little Black Watershed, Butler and Ripley Counties, Missouri and Clay County, Arkansas, has been reviewed by this office.

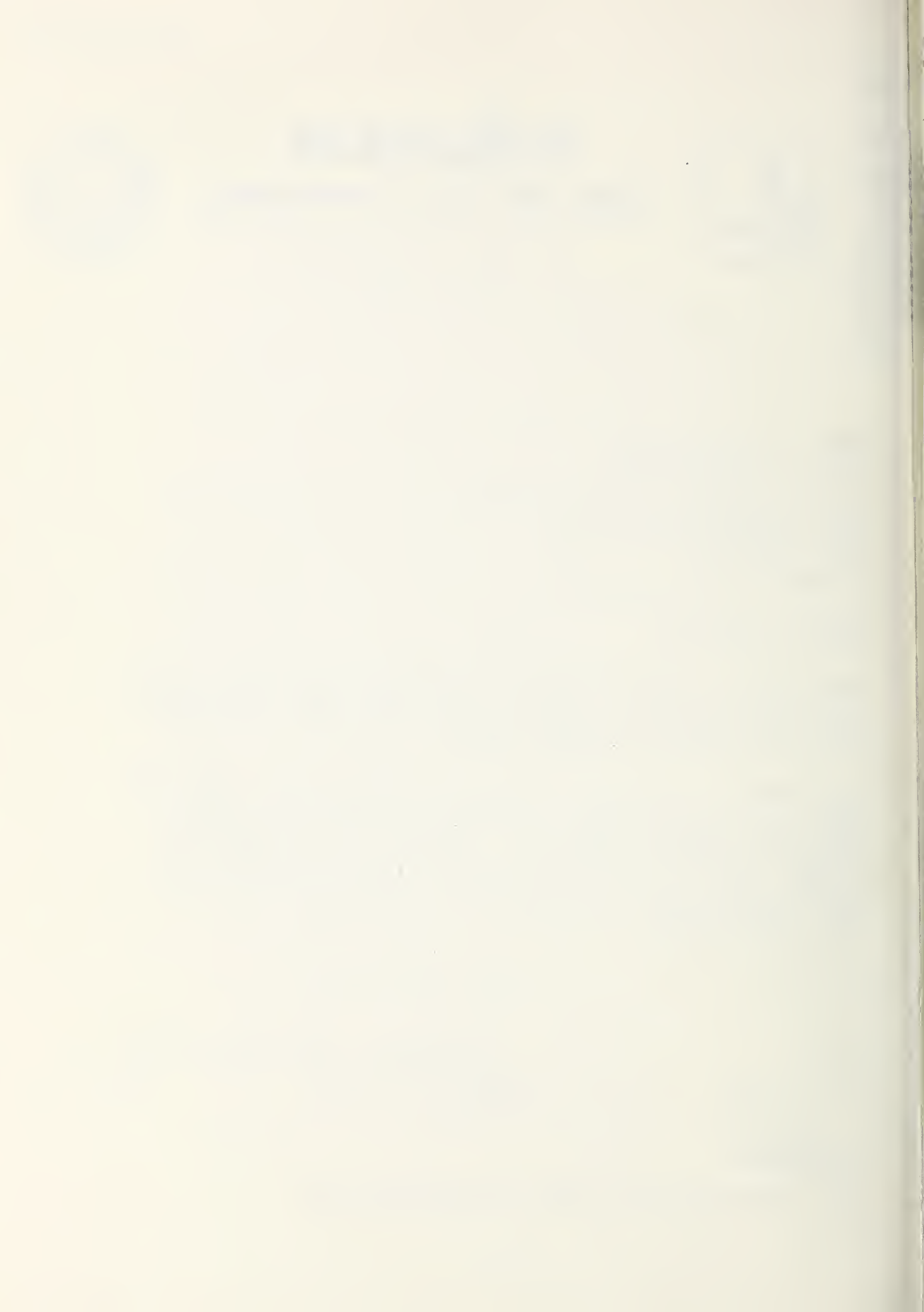
Our District Fisheries and Game Biologists have inspected the area in Clay County and find that there is little wildlife habitat remaining. Concern for environmental damage would be mostly in the two Missouri Counties and we recommend close liaison with the Missouri Department of Conservation.

Very truly yours,

A handwritten signature in cursive script that reads "Andrew H. Hulsey".
Andrew H. Hulsey,
Director

AHH:DGC:ac

cc: Larry Gale, Mo. Dept. of Conservation



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East Arkansas
Planning & Development District

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ancis

P. O. BOX 1403

706 SOUTH MAIN

JONESBORO, ARKANSAS 72401

AC 501/932-3957

DOLORES P. HARRELSON, EXECUTIVE DIRECTOR

March 7, 1975

Mr. J. Vernon Martin
State Conservationist
Soil Conservation Service
P. O. Box 459
Columbia, Missouri 65201

Re: Review of the application from the Clay County Soil
and Water Conservation District for implementation of
a work improvement plan for the Lower Little Black
River Watershed

Dear Mr. Martin:

Utilizing policies established by the District and the
State Department of Planning concerning Regional Clearing-
house Notification, Review and Comment procedures, the
East Arkansas Planning and Development District has
reviewed the above referenced application.

The Board of Directors of the East Arkansas Planning and
Development District considered the recommendations of
the District Technical Review Committee. The Board voted
to recommend approval of the application. Comments where
appropriate are attached.

Cordially,

Dolores P. Harrelson
(Mrs.)

(Mrs.) Dolores P. Harrelson
Executive Director

DPH/sm

cc: Bert Wakeley, State Clearinghouse

Clay County Soil and Water Conservation District - Work
Improvement Plan for Lower Black River Watershed

STAFF RECOMMENDATION

Billy Gilbreath made the motion to recommend approval of this application because it is in conformity with the White River Basin Development plans. Bob Treneman seconded the motion. The motion was carried unanimously.

TECHNICAL REVIEW COMMITTEE

Lawrence Hamilton made the motion to concur with the Staff Recommendation. J. E. Beasley seconded the motion. The motion was so carried.

BOARD ACTION

The Board of Directors, by ballots mailed February 27, 1975, concurred with the above recommendations.

65802

STATE HIGHWAY COMMISSION

DUNCAN, Vice Chairman
 h Second St.
 64503

AUER, Member
 d Avenue
 y 64108

AN, Member
 177

LANDGRAF, Member

rdeau 63701

WOODS, Member
 tell
 63108

BRUCE A. RING, Chief Counsel

L. V. McLAUGHLIN, Ass't. Chief Eng

MRS. IRENE WOLLENBERG, Secretary



Jefferson City, Missouri 65101
 Telephone (314) 751-2551

February 25, 1975

GENERAL: A-95 Review
 Application No. 75020075
 Application No. 75020076
 Application No. 75020077

Mr. Terry Rehma
 A-95 Coordinator
 Office of Administration
 Division of State Planning and Analysis
 Capitol Building - P. O. Box 809
 Jefferson City, Missouri 65101

Dear Mr. Rehma:

The Work Plan for the Upper Little Black Watershed and the Lower Little Black Watershed, as well as the Draft Environmental Impact Statement for Little Black Watersheds, by the U.S. Department of Agriculture, Soil Conservation Service, involving a project in Butler, Carter, and Ripley Counties will affect State highways in the area.

The Applicant should be informed that the detail plans for any work affecting State highways in Carter County should be approved by our District Office on U.S. Route 63 in Willow Springs and in Butler and Ripley Counties, by our District Office on U.S. Route 61 in Sikeston before advertising any work for bids. In fact, it is preferable that any work affecting State highways be coordinated early in the planning with the appropriate Districts.

Very truly yours,

L. V. McLaughlin
 Assistant Chief Engineer -
 A-95 Review Agent





MISSOURI DEPARTMENT OF CONSERVATION

2901 North Ten Mile Drive - Jefferson City , Missouri 65101

P. O. Box 180 - Telephone 314 751 4115

CARL R. NOREN, Director

March 10, 1975

Mr. Terry Rehma
Clearinghouse Coordinator
Division of State Planning and Analysis
Office of Administration
Room B-22, State Capitol Building
Jefferson City, Missouri 65101

Re: SCS - Little Black Watershed EIS

Dear Mr. Rehma:

The Department of Conservation has reviewed the draft Environmental Impact Statement for the Little Black Watershed Project. In general, we find the draft a thorough assessment of the present environmental situation within the watershed, however we have some reservations with the statements concerning beneficial and adverse environmental impacts.

Our primary concern is with the fate of the fishery presently found in the Little Black River. We do not agree that the changed flow conditions and water quality will benefit fish without qualification. Conversely, the alteration of the free flowing character of the Little Black will reduce the viability of fish populations presently dependent upon a natural flow regimen. Species affected not only include the smallmouth bass, but other riffle species such as darters.

In view of the mandate on Federal agencies by the 1973 Endangered Species Act, this draft Statement is generally lacking in the treatment of probable effects. The harlequin darter, for example, a riffle species is given passing mention but further discussion is needed on the probable effects this project might have on its existence.

Further detailed comments on the draft Environmental Impact Statement follow:

Page 59 - Where are the endangered species listed? If in an appendix, a reference should be provided.

- Page 87 - If the 50 acres at the diversion structure and 50 acres elsewhere are for mitigation purposes, then these lands should be identified as such here. The 50 acres at the diversion structure are listed as recreational lands elsewhere.
- Page 95 - Changed flow conditions will not benefit all fishes. In fact, these changes may be deleterious to many species in the upper and middle river.
- Page 97 - Reduced recruitment of smallmouth bass is fairly likely; reductions in other riffle species may also occur. Structural measures in both the uplands and lowlands may adversely affect rare, declining or endangered species.
- Page 98 - It is highly probable that additional clearing of the flood plain will follow project completion. Experience with similar projects elsewhere should be cited to substantiate these losses.
- Page 106 - The loss of free flowing stream fishes should be listed as an irreversible and irretrievable commitment of resources. An estimate of the energy consumption needed for project completion would also qualify in this section.

In addition, the Department of Conservation has reviewed the work plans for the upper and lower Little Black projects. These drafts are substantially the same as previous drafts reviewed by the Department and no major comments are needed here. The Department does have several minor comments which will be forwarded directly to the Soil Conservation Service however. The opportunity to review these drafts is appreciated.

Sincerely,


EDWIN H. GLASER
PLANNING OFFICER

EHG:cgl

cc: U. S. Fish and Wildlife Service
Kansas City, Missouri

MISSOURI CHAPTER

The Wildlife Society

P.O. BOX 372
COLUMBIA, MISSOURI 65201

April 7, 1975

Mr. J. Vernon Martin
State Conservationist
Soil Conservation Service
P.O. Box 459
Columbia, Missouri 65201

Re: Little Black Watershed Environmental Impact Statement

Dear Mr. Martin:

The Missouri Chapter of the Wildlife Society has reviewed the draft Environmental Impact Statement for the Little Black Watershed. The document is well prepared and obviously has the support of much field research.

We are pleased to find that the project does recognize that terrestrial losses will occur, and that your agency has provided for mitigation measures. These lands should be identified and inspected for compliance for the project's life. The draft Environmental Impact Statement does not identify latent losses from land clearing once flood control is provided. These losses which are likely to occur, will undoubtedly remove vestiges of lowland hardwoods. This particular forest community is becoming a rare type in southeastern Missouri and efforts should be made to preserve in kind. There are many other species of swamp flora associated with these timber stands that also deserve recognition and preservation. Present mitigation measures may not be sufficient in this respect. Another rare terrestrial plant, corkwood, is known to exist in this watershed and hasn't been identified in your draft.

The Missouri Chapter of the Wildlife Society is of the opinion that the proposed project will alter the present stream ecosystem. The Little Black River is an exceptionally diverse stream. The stream contains many different species of plants and animals in a highly scenic setting. Several rare and endangered species are also known to exist. Every conceivable measure to preserve the integrity of this ecosystem should be made. Present measures should be specifically listed in your draft.

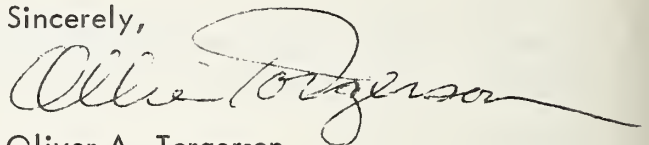
Mr. J. Vernon Martin
April 7, 1975
Page Two

In addition, probable effects should be matched with workable steps to offset losses so that future losses can be mitigated. Efforts should be made to identify stream changes during and after project construction.

Finally, we would appreciate additional emphasis on the installation of land treatment practices. Experience gained by several of our members indicates that there is no real assurance that improved land treatment measures will be provided on significant acreages of private land unless there is a real incentive to do so. What does the Service plan to do in the event that these incentives are not provided?

The Missouri Chapter has appreciated the opportunity to review this document.

Sincerely,

A handwritten signature in cursive script, reading "Oliver A. Torgerson". The signature is written in dark ink and is positioned above the printed name and title.

Oliver A. Torgerson
President

OAT:sss

KANSAS HISTORIC PRESERVATION PROGRAM

WEST THIRD STREET, LITTLE ROCK, ARKANSAS 72201 501-374-0975



"THE OLD STATE HOUSE" 300 WEST MARKHAM LITTLE ROCK, ARKANSAS 72201
TELEPHONE -- 501 371-1639

July 24, 1975

J. Vernon Martin, State Conservationist
USDA, Soil Conservation Service
Parkade Plaza Shopping Center-Terrace Level
Box 459
Columbia, Missouri 65201

Dear Mr. Martin:

In response to your letter of May 23, 1975, I have been informed by the staff of the Arkansas Historic Preservation Program and the staff of the Arkansas Archeological Survey that these two organizations have reviewed "An Assessment Of The Cultural Resources Of The Little Black Watershed". Based on the recommendations made to me by these two organizations, I concur with Dr. Price's recommendation concerning sites eligible for the National Register. It would appear based upon the recommendation of Dr. Charles McGimsey that site 3CY34 may be eligible for a nomination to the National Register.

I concur with Dr. Price's recommendation that 3CY160, 162, 163, 164, 165, and 166 should be tested.

Since the Little Black Archeological District lies totally within the State of Missouri I feel that any comment as to whether the project impacts on these sites will seriously affect the integrity of the District, is a matter to be determined by the State Historic Preservation Officer for Missouri. After reviewing all of the reports available to me concerning this projects impact on Arkansas' resources I feel that the public meeting and tour held on November 11, 1974, fulfilled the requirements of Section 809.5 (B) and (C) of the councils procedures with regards to public input.

If we can be of any further assistance to you in this matter please let us know.

Sincerely,

Gene Richardson
State Historic Preservation Officer

GR:dmk

